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ABSTRACT

This work considers desktop publishing technology as a way used to paginate newspapers electronically, tracing the technology's development from the beginning of desktop publishing in the mid-1980s to the 1990s. The work emphasizes how desktop publishing technology is and can be used by weekly newspapers. It reports on a Pennsylvania weekly newspaper study's finding on the level of use of desktop publishing and related technologies, noting significant use of basic desktop computer systems and additional desktop publishing-related technologies. Further, that study found use of such technology increases as the number of pages published increases and as the population density of the area in which the paper is published increases. Also reported are interviews with several Pennsylvania weekly newspaper journalists, who discuss how their organizations have used desktop publishing technology and interviews with industry experts on how weekly newspapers can use desktop publishing technology as it existed in spring 1995. The experts outline a basic desktop publishing system that can be started for less than $9,000, plus the cost of a computer. Finally, the work considers the development of new computer-related technologies that can permit newspapers, weeklies, and dailies to publish in alternative forms, such as online publication, fax news systems, and bulletin board systems. Many of these systems have been developed at universities--for example, Stanford has an interactive Media Link campus news service, and the University of Missouri has tested an electronic newspaper. Appendixes contain the study questionnaire, tables and tests, a rationale for selection of statistical test, uses of technology, and a 335-item selected bibliography. (TB)

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Desktop technology for newspapers: Use of the computer tool

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Abstract

This work considers desktop publishing technology as a way used to paginate newspapers electronically, tracing the technology's development from the beginning of desktop publishing in the mid-1980s to the 1990s. The work emphasizes how desktop publishing technology is and can be used by weekly newspapers. It reports on a Pennsylvania weekly newspaper study's findings on the level of use of desktop publishing and related technologies. That study finds significant use of basic desktop computer systems and additional desktop publishing-related technologies. Further, that study finds use of such technology increases as the number of pages published increases and as the population density of the area in which a newspaper publishes increases. This work also reports on interviews with several Pennsylvania weekly newspaper journalists, who discuss how their organizations have used desktop publishing technology. The degree to which the technology is used ranges from limited to extensive. The work also contains interviews with industry experts on how weekly newspapers can use desktop publishing technology as it existed in spring 1995. The experts outline a basic desktop publishing system that can be started for less than $9,000, when the cost of a computer is added. Finally, the work considers the development of new computer-related technologies that can permit newspapers, weeklies and dailies, to publish in alternative forms. These forms include online publication, fax news systems and bulletin board systems.

Chapter 1:

The computerized world

The world of the working journalist – like that of people in countless other professions – is becoming more and more connected electronically. One may link up with someone else using cellular phones, portable fax machines, voice mail, e-mail, computer billboards, portable satellite-telephone equipment, laptop computers with modems, video cameras, portable printers, micro tape recorders, pocket-size shortwave radios and equipment that can send still photographs via satellite links (Ward & Hansen, 1993). And that's not an exhaustive list.

Further, manufacturers continually strive to make equipment that is more powerful and less expensive. Zenith introduced a notebook computer in the spring of 1994 that the company said features full-motion video, audio, a microphone, stereo speakers, a CD-ROM and a networking module, among other things (Zenith Data Systems Corp., 1994, May 25). In April 1995, the top-of-the-line Z-NOTEFLEX cost $5,757 at Erie Computer in Erie, Pa., and an add-on Z-PLAYER portable multimedia unit cost $499 (A. Leopold, personal communication, April 13, 1995). Meanwhile, IBM Corp. is looking to the personal computer realm to improve its mainframe computers – basing new, less-expensive, more-efficient chips to run its mainframes on a design used for personal computers (Hays, 1994, February 14). Also, Sequent Computer Systems Inc. links Intel chips to create multiprocessing computers that rival mainframe computers in terms of power but cost a lot less ("Sequent says it's open," 1994, February 11). And in May 1994, scientists in Albuquerque, N.M., at Sandia National Laboratory said they ran a Linpack speed test on Intel Corp.'s Paragon supercomputer and it set a world record of 143.4 billion operations a second (Bulkeley, 1994, June 23). Now the company plans to replace Intel i860 microprocessors that currently power the Paragon with later versions of its Pentium chip (Bulkeley, 1994, June 23). The power of the personal computer is growing.

Yet, Ward and Hansen (1993) point out that technology has its pluses and minuses. The pluses include that it lets communicators be better informed and better searchers and users of information that is sent to the audience, while the minuses involve information and technical overload (Ward &

Hansen, 1993). Further, a 1990 American Society of Newspaper Editors report, which summarized a research project aimed at designing a paper for the year 2000, had noted at the beginning of the decade that readers will accept gimmicks and fancy designs if they make it easier to consume information but won't accept them if they don't and aren't relevant (Brooks, Kennedy, Moen, & Ranley, 1992). In short, technology should have a purpose if it is to be useful.

In that vein of technology with a purpose, desktop publishing emerged in the mid-1980s with the introduction of the Macintosh computer, the Apple LaserWriter printer and Aldus PageMaker (Bromley, 1992, July 17; Marano, 1992, January 27). The technology has expanded with the introduction of other software and the development of Windows for PCs (Marano, 1992, January 27). Indeed, desktop publishing has come to mean a wide range of things, from generating pages of graphics and text for newspapers to emerging desktop multimedia technology (Bromley, 1992, July 17). Aldus Corp. founder Paul Brainerd created the term desktop publishing (French, 1992, Fall), which basically is technology that lets users produce a publication by computer instead of by hand (Gabbay, 1992, April 10). In addition, Adobe Systems devised the computer language PostScript, which helped make desktop publishing possible (Jaben, 1988, September). PostScript lets desktop publishers use different types of software to produce documents of typeset quality (Jensen, 1992, February 24). PostScript is becoming the publishing industry's page-description-language standard; however, a 1991 ANPA survey found PostScript typesetters were used by only 10 percent of newspapers (Marshall, 1992, April). Still, it is expected by consultants and vendors that when older equipment is replaced the 10 percent number will increase (Marshall, 1992, April). All in all, at least conceptually, desktop publishing appears to be a brand of technology well-suited for the newspaper industry.

In fact, the newspaper industry has yet to flock to any specific type of electronic composition, or pagination, of its total product. A 1991 survey by the Bakersfield Californian and the American Newspaper Publishers Association of papers with 25,000 circulation or more found that only two of 735 editors said their papers were fully paginated, and 60 percent said their papers used electronic page composition to some degree – mostly for classified ads (Bowles, Borden, & Rivers, 1993). Yet by 1995 many more newspapers have become fully paginated. Most large U.S. papers have relied on their current system vendor to help them upgrade or replace what they have, and most have wanted the current vendor to develop a pagination system for them – though many have not favored the evolutionary route (Solimeno, 1991, December 6). Meanwhile in a survey conducted in a different publishing field in June 1992, Folio: found that more than one of every three magazines that had desktop publishing systems have developed job functions to handle technology – about 7 percent have a pre-press manager or director and 14 percent have a systems operator job (Angelo, 1992, September 1). Further, more than one of each three production executives surveyed in June 1992 by Folio: said digital technology made their jobs more efficient and easier, but about one in six said their jobs have become more complicated due to digital and desktop technology (Angelo, 1992, September 1). As with many technologies, it would seem flies remain in the ointment – at least for some people. Still, people generally must use some kind of technology – and learn to deal with its brand of bugs.

Movement to at least partial pagination has been increased by QuarkXPress and other desktop software as even big newspapers have been generating advance pages with such programs (Solimeno, 1992, June 29). The Atlanta Journal and Constitution has been involved in a pagination project with Digital Technology International, and in 1993 Tony De Feria, the paper's assistant managing editor for graphics, said pagination was merging journalists' roles in such ways as photographers creating captions and artists learning to produce layouts (Leeke, 1993, April 12). In addition, newspaper designer Robert Lockwood has said desktop publishing has freed publishers from assembly line-like linear progressions (Silverstone, 1992, April). Desktop publishing is seen as giving control back to individuals (Silverstone, 1992, April). Further, several leading desktop publishing developers have been working to make their software more compatible with electronic publishing as they consider paper just one of the media in which information can be distributed (Wood, L., 1992, December 15). Electronic publishing media cited are computer networks and CD–ROMs (Wood, L., 1992, December 15). If and when such media arise on a significant basis, each newspaper may have to ask itself whether such media are part of its competition or just another way it publishes its product. The question is not unlike that newspapers ask themselves concerning pagination: Do they adopt this technology or not?

Chapter 2:

The electronic newspaper

From Connecticut weeklies (Guglielmo, 1988, November 1) to the Messenger chain in Northern England (Balter, 1989, February 28) and from earthquake-shaken San Francisco dailies (Guglielmo & Pfiffner, 1989, October 24) to the daily Vincennes (Ind.) Sun-Commercial (Wood, M., 1991, January-February) and beyond, newspapers have tested and used desktop publishing technology to put together their newspapers electronically.

Indeed, a look at how pagination and related technologies have developed in the recent past is in order. With that in mind, this chapter provides a brief history that relates to newspapers.

In newspapers, pagination means drawing all page elements together for output on one piece of film – or four pieces of film for four-color pages – and Philip Jordan, pagination products director for pre-press systems vendor Information International Inc. (known as Triple-I), noted that newspapers want to paginate to cut labor costs and hike efficiency (DiNucci, 1993, April 12). Yet despite pagination advantages of cost savings, quality improvement and newsrooms getting control of their newspapers, many papers were cautious about adopting pagination due to big equipment costs and the desire to wait for the best system (Bowles, Borden, & Rivers, 1993). Indeed most papers used systems that supplied typesetting and database management but not graphics, with elements pasted together in composing rooms, and it was felt many papers would stick with their specialized systems' hardware even if Macintoshes could supply the same features as the specialized systems because the older systems represented big capital investments made generally within the last 10 years (DiNucci, 1993, April 12).

One big thing that kept newspapers from paginating with Macintoshes was the lack of Macintosh-based publication management systems powerful enough to integrate advertisements, text and graphics (Lehman, 1993, April 12). However, Carl Schierhorn (personal communication, April 12, 1995) has noted that QuarkXPress can now perform these functions, though the software does not provide database management and tracking on its own. In 1993, Macintosh-based management products included two that had gained ground at newspapers – those by Digital Technology International of

Orem, Utah, and Quark Publishing System (QPS) by Quark Inc. of Denver, Colo. – plus other products such as P.Ink Press by P.Ink America Corp. of New York; PIMS (Publication Information Management System) by Ideas to Print Inc. of Naples, Fla.; and Publication Administrator by North Atlantic Publishing Systems Inc. of Chelmsford, Mass. (Lehman, 1993, April 12). Cole (1993, April 12) identified Quark Publishing System and Digital Technology International systems as Macintosh-based versions of closed, proprietary systems for newspapers – not open systems. He said companies such as Managing Editor Software Inc. and Baseview Products had developed products that offered a relatively open environment; however, these didn't provide total systems – such as Quark's and DTI's – or resolve in an open environment problems like the need for a heavy-duty word processor, multi-user environments and big databases for graphics and text (Cole, 1993, April 12).

This is not to say that the only avenue to electronic pagination has run through a Macintosh computer. At NEXPO '93 in New Orleans, Harris Publishing Systems introduced a PC-based front-end editorial system that operated through Windows 3.1 (Colbert, 1993, July/August). The system by Harris, a traditional newspaper industry vendor, could support more than 400 editorial terminals and link wire services, libraries and other things (Colbert, 1993, July/August). Also at NEXPO '93, Dewar Information Systems Corp. unveiled a PC-based publishing system, DewarView, that could be linked with off-the-shelf software to write, design and produce pages (Colbert, 1993, July/August). A beta version of DewarView had been shown at the ANPA/TEC '92 show in June 1992 in Atlanta, running on Windows 3.1 and using Microsoft Word for text editing (Solimeno, 1992, June 29). It was expected to support WordPerfect also because that software was considered a leading editing program in the industry (Solimeno, 1992, June 29). Dewar designed its product to work with Quark's Windows version, and Dewar said the H&Js in the editing and QuarkXPress programs generally were within a line of each other (Solimeno, 1992, June 29).

Still, the Macintosh has long been seen as playing a pervasive role in the newspaper industry, with Roger Fidler, then Knight-Ridder graphics and technology director, at one time calling the Macintosh the only practical newspaper publishing tool available (Silverstone, 1988, November 1). Yet in 1988, most big daily papers were seen as using Macintoshes solely for creating charts, maps and graphs used with stories, although a few designers used QuarkXPress or other software on the

Macintosh to create layout mockups (Silverstone, 1988, November 1). However, industry experts at the Society of Newspaper Design's annual meeting in October 1988 in Louisville, Ky., thought microcomputer-based systems would handle the whole high-end publishing process soon – as they did already at some foreign daily and American weekly newspapers (Silverstone, 1988, November 1). And a year later an all-electronic color newspaper was generated using only desktop technology at the Society of Newspaper Design meeting Oct. 12-14, 1989, in Fort Lauderdale, Fla. (Silverstone, 1989, November 21). The newspaper was a 24-page tabloid called the Fort Lauderdale Chronicles, and it took three days to create it in a temporary newsroom in a hotel (Silverstone, 1989, November 21). Overall, this pattern of use – and possibilities – remains largely true today (C. Schierhorn, personal communication, April 12, 1995).

Although the speed of the Fort Lauderdale Chronicles may not be sufficient for some operations, a desktop publishing system already had proven sufficient for the 14-weekly Imprint Newspapers in Connecticut, which in July 1988 started using Microsoft Word for text, Aldus PageMaker 3.0 for news page layout and QuarkXPress 2.0 for composing advertisements (Guglielmo, 1988, November 1). Imprint planning and development director Robert Baldwin said halftones still were made in the darkroom because the company did not want to make what it saw as a large investment in imaging software, a scanner and the big amount of memory needed to handle images electronically (Guglielmo, 1988, November 1).

Indeed, in the area of cost, Imprint's system made many production jobs unnecessary (Guglielmo, 1988, November 1). Also, the profitable Messenger chain of 16 papers in Northern England used a Macintosh-based system that used PageMaker 2.0 and cost L250,000 – a tenth the cost offered by other systems (Balter, 1989, February 28).

And when the Messenger chain's publisher, Eddie Shah, decided to produce The Post in Britain in 1988, he used Macintosh computers and off-the-shelf software for all pre-press work; copy was generated, pages put together, photos scanned in and edited, and wire services sent to file server baskets (Balter, 1989, February 28). Low circulation caused the paper to fold after 33 issues, and PageMaker 2.0 was seen as having shortcomings when handling graphics-heavy pages or vast amounts of constantly changing classified ads (Balter, 1989, February 28). But in 1992, students and faculty of a Spanish university published the official 50-page daily newspaper of the Olympics using PageMaker 4.0 for Windows, and the software was able to do all they wanted except color separations (Rooney, 1992, August 3). PageMaker 4.0 was found to be very easy to learn – even for people who didn't understand page layout (Rooney, 1992, August 3). It seems apparent that technological improvements occur that address concerns of those in the publishing field.

Another such concern is the reproduction quality of desktop publishing technology. A small magazine company's art director and part-time production manager, David Creamer (1988, June), said that early desktop publishing software did not have kerning and hyphenation abilities, and early hardware lacked output resolution and speed. However, he pointed out that in 1985 Allied Linotype developed two high-resolution output machines – one with 1,270-dpi (dots per inch) and the other 2,540-dpi resolution (Creamer, 1988, June). And about two years after the company got its first Macintosh in 1985, Letraset's Ready, Set, Go! 3.0 came out with autopagination, H&J and manual and automatic kerning (Creamer, 1988, June). Other software and output device improvements by other companies followed. Also by 1988, Yacht Vacations, a four-color glossy consumer publication, for about two years had been producing its editorial pages and many of its advertising pages using Macintosh computers, PageMaker, a laser printer, a modem and a distant service bureau's imagesetter (Thomas & Rogers, 1988, May). The laser printer was used for proofing, while color photos were stripped onto camera-ready pages produced by the imagesetter (Thomas & Rogers, 1988, May). In addition, two award-winning coffee-table books were produced using a 300-dpi laser printer for layouts and text, while color separation and stripping work was contracted out (Arneberg, 1992, September 21).

It is apparent that the production requirements of newspapers are different from those of magazines or photographic books. Still, such publications do have quality requirements at least as high as most newspapers. It then seems that desktop publishing technology can produce layouts and text of sufficient quality for newspapers. However, what quality level is acceptable remains a subjective judgment for publishers to make.

Some newspapers have chosen desktop publishing as part of their operations. In 1993, except for art and advertising, the 40-page Washington Post National Weekly Edition (circulation 40,000) was put together on Macintoshes using QuarkXPress and other off-the-shelf software (DiNucci, 1993, April

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12). Editor Larry Meyer said the system increased productivity (DiNucci, 1993, April 12).

Still other newspapers used desktop publishing technology more thoroughly. The Daily Kurir in Hungary started July 2, 1990, and was produced using Macintoshes, Microsoft Word and QuarkXPress (Lewis, 1990, October 16). Editor Andre Aczel noted that the staff had problems using the technology but was always able to produce a paper (Lewis, 1990, October 16). The daily Vincennes (Ind.) Sun-Commercial gradually switched to a Macintosh computer production system, which cost less than $500,000 (Wood, M., 1991, January-February). The system incorporated Macintosh computers, QuarkXPress and Adobe Photoshop picture editing software, Monotype 1,000-line-resolution PostScript-output Express typesetters, AP GraphicsNet and AP's news and photo service (Wood, M., 1991, January-February). The GraphicsNet is a satellite system by which AP transmits graphics, and the news and photo services are satellite and terrestrial delivery systems for transmitting text and images (T. Smith, personal communication, April 14, 1995). Also, L'Indipendente was a new broadsheet daily paper in 1992 started in Milan, Italy, with a fully paginated system – including photos and graphics – that sent output direct to film with no local typesetting or pasteup but with full backup (Solimeno, 1992, May 22). In the backup process, files are duplicated on independent storage devices, guarding against data loss if a system fails. All pre-press work was done in Milan, then sent electronically to two other locations for printing (Solimeno, 1992, May 22). In addition to PCs, Macintoshes and QuarkXPress for layout, the system incorporated Vax computers as servers (Solimeno, 1992, May 22). Also, the Henderson (N.C.) Daily Dispatch used Digital Technology International's editorial system in the production of 30 pages daily, and moved to add DTI's display ad system (Lehman, 1993, April 12). General Manager Dennis Tharrington said the database let the paper quickly and easily draw together graphics, text and ads (Lehman, 1993, April 12).

Still other newspapers chose to move toward traditional newspaper industry vendors for electronic pagination systems and used desktop publishing technology along the periphery, if at all. The Oklahoma City Daily Oklahoman adopted a System Integrators system with several small peripheral systems tied to it, such as editorial art and creative services (Solimeno, 1991, December 6). The Oklahoman wanted a homogeneous, integrated pagination system, and except for the small peripherals the system was wholly by System Integrators (Solimeno, 1991, December 6). The Portland

Oregonian installed Harris news pagination and Images graphics systems, automating its page production process ("Harris Controls," 1992, March 16).

However, even traditional vendors recognized the power of desktop publishing. Atex, the developer of a proprietary system, which is a system that uses only one company's hardware and software, in 1990 switched to an open system that let those using Atex plug in hardware and software from other companies (Potter, 1992, July). Indeed, Atex developed PC-based editorial and Macintosh-based pagination systems to unveil at the 1992 ANPA conference to keep customers from switching to QuarkXPress ("Atex to unveil," 1992, May 22). Further at that time, Atex started to see its role as a modular systems integrator ("Atex to unveil," 1992, May 22).

Nearly three years earlier, the president of New York City-based magazine and book design company Graf/x, Tom Walker, pointed out that a product missing for magazine production was something to integrate the different elements – text, graphics programs, page layout, administration, work flow (Strothman, 1989, August). Such a product would serve newspapers as well.

After that time, workgroup publishing became a key development in the industry (Alexander et al., 1992, October 30; Miller, 1992, September 21). Atex Inc.'s server-coordinated Atex Workgroup Publishing let 10 to 200 people work on page layout or editorial copy at the same time; Ventura users were able to access common files; and electronic-document technology offered by Frame Technology Corp. let users create, distribute and share documents across computer platforms and authors (Miller, 1992, September 21). Quark Publishing System was made up of a server-resident database, QuarkDispatch, which tracked user-created files; an editing and word-processing program, QuarkCopyDesk; and QuarkDispatch XTension, which linked XPress with a QuarkDispatch menu that let users check CopyDesk articles, XPress layouts and other page elements (Said, 1993, January 11). Third-party applications could be tied into QPS through XTensions, and wire-service capture software could be linked to the system (Said, 1993, January 11). An XTension is an application that includes a computer code that allows QuarkXPress to connect with that application (D. J. Bradley, personal communication, April 14, 1995). Graphics system manager Carol Hartman of Christian Science Publishing Society in Boston, which publishes the Christian Science Monitor, said she liked how Quark Publishing System and QuarkXPress worked together (Said, 1993, January 11). She said stories edited in their Atex system couldn't be changed after being transferred to Quark without QPS (Said, 1993, January 11). The Christian Science Monitor had used QuarkXPress in laying out its four-color paper for several years and started using Quark Publishing System to produce its weekly, four-page international section after a test (Quark Inc., 1993, March). It planned to expand its QPS usage (Quark Inc., 1993, March).

To those who have considered desktop publishing it is apparent that a wide range of products are available. Indeed, two things that enhanced document publishing were cross-platform networks and cross-platform software (Bielawski, 1992, May 19). By 1992, top document-publishing software let users create and share files across platforms without losing or having to reformat data, and big professional publishing software vendors used an open architecture that accepted text and graphics files generated in and imported from other software (Bielawski, 1992, May 19). One company, Mycrotek Inc., was able to link QuarkXPress on a Macintosh to its IBM PC-based Mycro-Comp front-end newspaper system with Mycro-Comp Page, an XTension costing $4,595 that included other features such as ones to help jump a story (Said, 1991, May 14). The Opelika Auburn (Ala.) News was a 14,500-circulation daily that used such a system, and production manager James Dye said it let most workers use less-expensive PCs (Said, 1991, May 14). Another system exemplifying this open philosophy came from vendor Systems Integrators (SII). SII displayed at the ANPA/TEC '92 show in June in Atlanta its then new System 55/XR, which the company offered for about $12,000 a terminal (Solimeno, 1992, June 29). A system valued at more than $1 million was ordered by a Gannett daily in Tarentum, Pa., and it included classified software, editorial software, Digital Technology's AdSpeed and ClassSpeed, Managing Editor software and Quark pagination (Solimeno, 1992, June 29). By early 1995, the system had been running for two years (C. Schierhorn, personal communication, April 12, 1995). Also, another system focused solely on the PC platform. By 1992, 14 locations had installed Atex Inc.'s Workgroup Publishing System, which used IBM RS/6000 servers and PCs on networks running Writer Software and PC Page Makeup software (Alexander et al., 1992, October 30). Typically, Atex said, an installation had six production stations and 20 to 25 editorial stations at a cost of $11,000 to $12,000 a seat – that cost including installation, networking and training (Alexander et al., 1992, October 30).

As indicated by this review of the recent past, pagination technology has developed and changed relatively fast. Indeed, the hardware and software choices seem to be increasing rapidly in the field of newspaper-related desktop publishing. David Cole, proprietor of The Cole Group in San Francisco and an analyst of computer developments that affect the media, points out the dynamic nature of the technology (Wilson, 1995a, March). He notes that desktop publishing systems tend to adapt and grow (Wilson, 1995a, March).

Yet basic questions remain for publishers to answer. Can desktop publishing technology produce a product of acceptable quality? Can it do so at a speed fast enough to meet deadlines? Can it be purchased at an affordable cost? To each of these questions, there are those who have answered yes.

That answer has come from people running newspapers large and small. Some run daily newspapers. Others run weekly newspapers. Indeed, the editor of the Seybold Report on Desktop Publishing, Peter Dyson, points out that prosperous weekly newspapers are using a lot of desktop publishing tools, while daily newspapers have more of a mixture of different types of systems (Wilson, 1995c, March). Further, David Neeff, a contributing editor to Seybold Publications and an industry analyst, notes that weekly newspapers can rely on desktop publishing to create the whole product (Wilson, 1995d, March). Henceforth, it is the use of desktop publishing technology by weekly newspapers that is the focus of this study.

Chapter 3:

Desktop publishing for weeklies

As has been shown, desktop publishing can be on a small or grand scale. That includes newspapers publishing weekly. The Johnsonburg (Pa.) Press Inc. puts the contents of a page on a single disk and prints from one desktop computer (Wilson, 1995f, January). Another Pennsylvania weekly, the Times Chronicle, holds different kinds of information – photos, text, advertisements – on different servers and draws them together with a desktop computer to print out pages on broadsheet-size printers (Wilson, 1995g, January).

Yet the basic process is relatively simple, and it can become as complex as a weekly newspaper's needs dictate – and pocketbook permits.

David Cole, proprietor of The Cole Group in San Francisco and a media analyst, feels that any weekly of less than 50,000 circulation – or daily of less than 10,000 circulation – can use a system made with off-the-shelf technology (Wilson, 1995a, March). Cole was one of three men from around the country who analyze desktop publishing who discussed in telephone interviews how weekly newspapers could use the technology in their operations.

In addition to the computer sitting on the desktop, they all listed four basic types of software needed – word processing, page layout, photo editing and graphics software (Wilson, 1995a, March, 1995c, March, 1995d, March). Each named Adobe Photoshop for photo editing and QuarkXPress for page design, while Microsoft Word, Nisus Writer and WordPerfect were named for word processing and Adobe Illustrator and Macromedia Freehand were named for graphics (Wilson, 1995a, March, 1995c, March, 1995d, March). In respect to cost, contributing editor to Seybold Publications and industry consultant David Neeff estimated the cost of a copy of the four types of software he suggested at less than $2,300 – and the word processor suggested comes with a spreadsheet and database in Microsoft Office (Wilson, 1995d, March). Neeff pointed out that the trend is to use Word and Excel in classified production (Wilson, 1995d, March). Cole, a media consultant, noted a classified system also could be built with software from the company Baseview, and he added that he would have spreadsheet and telecommunications software on some computers and perhaps access to an online service (Wilson, 1995a, March).

Peter Dyson, editor of Media, Pa.-based Seybold Report on Desktop Publishing, pointed out that software is available and costs about the same for the Macintosh and IBM-compatible platforms (Wilson, 1995c, March). Dyson noted that a newspaper needs at least one big-screen computer, though such machines are not needed by reporters (Wilson, 1995c, March).

For an output device, Neeff recommended a 600-dpi (dots per inch), 11- by 17-inch laser printer with an estimated cost of about $2,500, adding that larger production operations may want to consider an imagesetter costing between $45,000 and $60,000 (Wilson, 1995d, March). Higher dpi levels produce crisper text or images in terms of quality (Wilson, 1995c, January). Neeff defined a larger operation as one with two or more publications using the same production schedule (printing at about the same time) with a total of at least about 40-50 broadsheet pages or 80-100 tabloid pages (Wilson, 1995d, March). In addition, Neeff recommended that a newspaper buy a color flatbed desktop scanner, which he estimated would cost about $1,000 (Wilson, 1995d, March). The purchase of an Apple QuickTake digital camera – for about $900 with all needed accessories – was listed as optional, and Neeff said it is OK for 4- by 5-inch or smaller black and white photos when used outdoors or with a flash (Wilson, 1995d, March). Possible uses he listed included car and real estate advertisement photos as well as head shots of people (Wilson, 1995d, March).

Using the cost estimates provided by Neeff, the basic system outlined by the analysts costs $6,700, including the optional digital camera. Even though that does not include a computer cost estimate, which can vary, it still seems to be a relatively small capital investment. To add a computer cost example, one seller has offered a Power Mac 6100/66 – including monitor, keyboard and CD-ROM – for $2,195 (Advance Business Center, 1995, June). Further, Neeff said that small operations could even buy less robust photo editing and graphics software, and they also could send their digital files to the printer on floppy or optical disks or via a modem and let the printer produce the PostScript output (Wilson, 1995d, March).

Still, the analysts did not stop after discussing a basic system. Cole raised the issue of workgroup connectivity – a file management system – which he said generally was not necessary for small newspapers, which usually have 10 or fewer editorial people (Wilson, 1995a, March). The thing to consider, he said, is scaling technology to the size of the publication (Wilson, 1995a, March). Neeff recommended workflow management software, at an estimated cost of $1,500 a copy, for more complex or larger editorial or advertising operations (Wilson, 1995d, March). He named a number of possibilities, including Baseview, DewarView, CText, PPI (for advertising), Freedom System Integrators, QPS and Managing Editor ALS and CLS (Wilson, 1995d, March). The workflow management products create XTensions to QuarkXPress for Macintosh computers and PCs (Wilson, 1995d, March).

For large operations wishing to hook up to a wire service, Neeff listed the option of buying QuickWire for $6,000 a site to capture, distribute and manage wire copy (Wilson, 1995d, March).

Dyson pointed out that as a news organization expands, it has to develop a network; it needs centralized file tracking and storage and may need a messaging system to contact people (Wilson, 1995c, March). Further, he pointed out that organizations expanding into different towns may need long-distance linkages like modems (Wilson, 1995c, March). Dyson said modems are good for volumes of no more than about 24 megabytes a day, but he noted they don't move data fast enough for large deadline files, which require leasing special lines (Wilson, 1995c, March).

Yet Cole pointed out that modems can link weekly papers very well (Wilson, 1995a, March). By using modems, Neeff noted that a computer "newsroom" can be created, and the fact that people are in different locations doesn't affect it at all (Wilson, 1995d, March). Further, Cole said newspapers can use Appletalk Remote Access, costing $189, to let people at remote offices dial into the main office and enter the main office network (Wilson, 1995a, March). Cole said a newspaper should use a 14,400 bits per second or faster modem, adding that text, photo and page files can be transmitted (Wilson, 1995a, March). A rough estimate is that such a modem can send or receive 4.5 megabytes per hour (Wilson, 1995d, January). In addition, Dyson noted that Tribe is one of several companies to make a device that sits on a network and lets several people log into the network from a distance (Wilson, 1995c, March). Dyson pointed out that such a device is good for stringers, and he estimated the Tribe device cost between $1,500 and $2,000 (Wilson, 1995c, March).

Cole noted that desktop publishing systems have a tendency to grow and adapt, and he pointed out that smaller newspapers' systems are constantly evolving – as is the technology itself (Wilson, 1995a, March). As a news organization expands, it should buy newer technology and pass the earlier technology on to people with less need for leading technology (Wilson, 1995a, March). For example, if a layout editor got a new Power Macintosh 8100 computer, that editor should pass the older, less powerful computer he or she had been using to a reporter, perhaps, who had less need for such a powerful machine. Cole also noted that different size organizations need different levels of technology (Wilson, 1995a, March). As an example, he pointed out how a small newspaper can use just Localtalk and Appletalk, but when a newspaper has more than 10 machines, when quality ambitions rise, when more color files are used, the paper has to upgrade to Ethernet or Fast Ethernet (Wilson, 1995a, March). Standard Ethernet and Fast Ethernet are networking standards (Wilson, 1995d, January).

It then seems that weekly newspapers need to be well aware of the basic processes of desktop publishing and be ready to adapt to the opportunities presented when technology improves.

Basic desktop publishing processes

Basically, text enters the system and is stored on some type of device – a floppy disk, a hard drive, a CD-ROM, an optical disk, a tape drive or some other alternative.

That text may be entered into the system by a person typing on a computer keyboard, by someone sending it in digital form via modem, by faxed or typed copy being scanned into the system using OCR (optical character recognition) software, from a floppy disk or CD-ROM that has been sent to the newspaper, or from a wire service. To be usable, text arriving from outside the system must be in a format the computer system can work with. Generally, this means the text file has been created in a type of software the newspaper's system has or can import into a type of available software.

Once entered, the text can be manipulated for whatever use the newspaper decides is appropriate. That manipulation may be done, generally, by a person running software on a desktop computer. The text may be edited. And, using desktop publishing software such as QuarkXPress and PageMaker, it can be put in columns in page layouts – with the person running the computer deciding the type's width and size and face, among other things.

Yet this is a visual age, and all text and no graphic elements would make a dull newspaper. Therefore, graphic data also can be brought into the system to be used with news or advertising copy. Someone at the newspaper can use software to create a variety of graphical elements – drawings, logos, bar charts, pie charts, etc. Also, graphics may be brought into the system by a scanner, a CD-ROM or floppy disk that has been sent to the newspaper, or through a modem from a remote office or advertiser. Just as in the case of text, graphics arriving from outside the system must be in a format the computer system can work with if it is to be usable. Generally, this means the graphics file has been created in a type of software the newspaper's system has or can import into a type of available software. Once in the system in a compatible format, graphics can be put into news and advertising layouts.

Photographs also can be brought into the digital realm of the desktop computer, where they may be manipulated and placed in news columns or advertisements. Traditionally generated continuous tone photographs can be scanned into the system using flatbed scanners. Slides or negatives also can be scanned into the system using an appropriate scanner. Further, it is possible to generate the image with a digital camera. In addition, photographs may be supplied or stored on CD-ROMs for use in a digital environment.

Advertisements can be created digitally as well. Text, graphics, screens and photographs can be combined in display and classified advertisements as desired with the use of appropriate software and/or scanners. In fact, many of the journalists interviewed for this study noted using desktop publishing software – PageMaker, QuarkXPress – to create advertisements. In addition, advertisements also can be brought into a system through a modem, floppy disk or CD-ROM.

Once in the desktop system, the text, graphics, photographs and advertisements can be combined – paginated – using desktop publishing software. The pages then may be printed using laser printers or imagesetters.

All the hardware and software discussed can be linked to or put on a single desktop computer – from word processing software to printers. Therefore, these processes – and the efficiencies their users tout – are available to the smallest operation.

Yet if computers and hardware are linked on a network, the digital information can be shared among several people – at one or several locations. Through local networks digital copy, graphics, photographs and advertisements can be passed to people as needed, saving time and materials (and the environment can benefit from the last part). Through wide area networks, distant bureaus may send copy, graphics, photographs and advertisements that are ready for use by a newspaper. Such an arrangement would seem to have obvious benefits for newspapers with distant bureaus or correspondents or for companies running more than one newspaper and printing all newspapers at one plant.

The study

Still, if the process is so relatively simple, one may raise a question: What level of this technology has been adopted by how many weekly newspapers? To help answer the question, the study reported in the following chapters focused on the use of desktop publishing technology by weekly newspapers in Pennsylvania. It is hoped that results generated by this study can foster a greater understanding of how desktop publishing is used.

Chapter 4:

Findings of the Pennsylvania Weekly Newspaper Technology Study

Weekly newspapers have been identified as leading users of desktop computer technology (Wilson, 1995a, March, 1995c, March, 1995d, March; Silverstone, 1988, November 1). In order to measure the use of desktop computer-related technology, the Pennsylvania Weekly Newspaper Technology Study was conducted.

Method

Each of the 173 newspapers named in the 1992 Editor & Publisher yearbook as a Pennsylvania weekly newspaper was mailed a 25-item questionnaire (see Appendix A for complete questionnaire). The questionnaire was first mailed on Aug. 19, 1993. A postcard encouraging recipients to participate in the study was mailed Aug. 27. A second mailing of the questionnaire was made on Sept. 30 and Oct. 1. Responses were received for 88 newspapers, with the last one postmarked Dec. 28, 1993. The data was coded and analyzed using the Statistical Package for the Social Sciences (SPSS).

Table 1

Number of Newspapers in Sample by Location, Size

Location	Rural		Suburban/Urban
Number of newspapers	41		46
Pages Published	16 or less	17 to 32	33 or more
Number of newspapers	25	36	27
Circulation	5,000 or less		5,001 or more
Number of newspapers	36		34

Note. The table lists responses given by the 88 newspapers in the study. Not all respondents answered all questions.

Results

The sample was split relatively evenly between rural newspapers and suburban or urban newspapers, as well as between those with a circulation of 5,000 or less and those with a circulation of 5,001 or more (see Table 1). In terms of the number of pages in a typical issue, the largest number of newspapers reported producing 17 to 32 pages, while relatively equal amounts said they published either 16 pages or less or 33 pages or more (see Table 1). However, it should be noted that a large number of the respondents could not be defined in terms of circulation, and analytical tests run using circulation as an independent variable yielded results that were not statistically significant (see Appendix B for statistical tables and test results).

How the newspapers use computer technology is outlined in Table 2. Overall, only two of the 88 newspapers said their reporters did not write stories on some type of computer, with the Macintosh the favored type used (see Figure 1). Respondents overwhelmingly edit copy in whole or part on computer, with few editing solely with pencil and paper. Still, almost half did report editing both on computer and with pencil and paper.

Figure 1: Computer types used

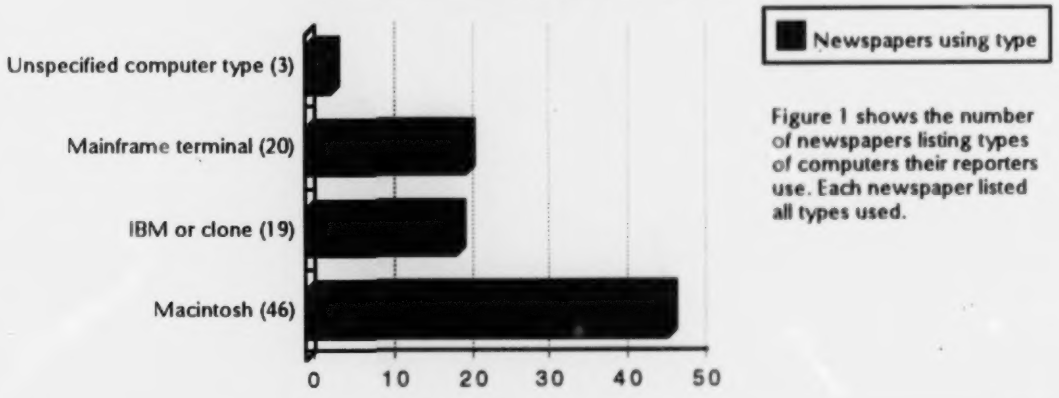

Figure 1 shows the number of newspapers listing types of computers their reporters use. Each newspaper listed all types used.

A large majority said they used computers to design advertisements. This was done overwhelmingly on the Macintosh. Further, only one-fourth of the respondents reported using methods other than computers to design ads.

BEST COPY AVAILABLE

The use of computer technology declines, though, when pagination is considered. Still, more than a third report paginating except for photographs, though few paginate including photographs. However, more than one-fourth do not manually paste together pages. But a large majority say advertisements are not placed using electronic pagination technology. Thirty of the 32 respondents who paginate report using a Macintosh.

In addition, nearly two-thirds of the respondents report using a laser printer to set type. Also, nearly two-thirds indicate they operate networks as they use networking software, though only about one-fourth of the respondents say they use a server in their network.

Table 2

Use of Computer Technology by Weekly Newspapers

	Number of Newspapers	Percent of Newspapers
Write stories on computers	86	97.7
Edit copy on computers	81	92
Edit solely with pencil and paper	7	8
Design ads with computers	73	82.9
Use noncomputer methods to design ads	22	25
Place ads using electronic pagination	8	9.1
Paginate pages except for photographs	32	36.4
Paginate pages including photographs	4	4.5
Set type with laser printer	58	65.9
Use networking software	55	62.5
Use file server	23	26.1

Note. Responses were received for 88 newspapers.

The questionnaire also sought to learn what technology was used beyond the more basic hardware and software. Participants were asked about their use of modems, scanners, graphics software and photo editing software. Though none of the technology is used overwhelmingly, items are used by large numbers of respondents (see Figures 2, 3).

Figure 2: Technology used by news-editorial personnel

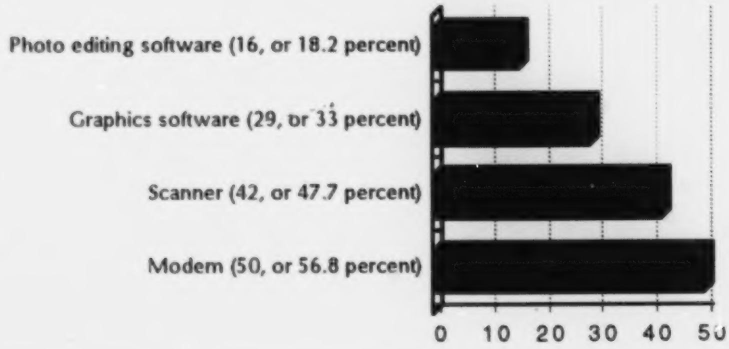

Figure 2 shows the number of newspapers listing types of electronic technology used beyond basic system technology by news-editorial personnel. Newspapers were asked to list all types used.

Figure 3: Technology used by advertising personnel

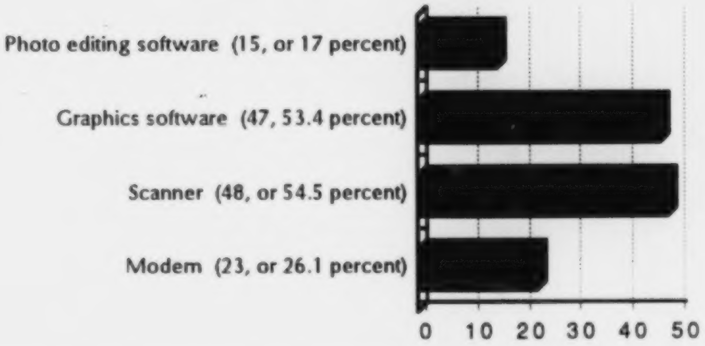

Figure 3 shows the number of newspapers listing types of electronic technology used beyond basic system technology by advertising personnel. Newspapers were asked to list all types used.

In an effort to learn the level of technology used by individual newspapers, a scale of basic computer technology use and two indexes of additional computer technology use were constructed. All three measures were composed of five variables, permitting scores ranging from 0 to 5, with 5 being the most extensive use of technology on the measures (see Appendix B for tables and statistical tests).

On the scale, if a computer was used only to write stories at a newspaper, that respondent received a rank of 1. If copy was written and edited on a computer, the newspaper was given a rank of 2.

A paper received a rank of 3 if – in addition to writing and editing on a computer – it used networking software, indicating it operated a computer network. If a newspaper did these three things and created pages by paginating except for photographs, it was given a 4 ranking. A 5 rank was given to newspapers responding that they did the four more basic things and also created pages by paginating fully. If none of these types of technology was used, a 0 rank was given. If a paper used a level of technology without using all lower-ranked forms, that case was not counted. Five cases were discounted in this way.

Respondents grouped heavily and evenly at the 2, 3 and 4 levels. The scale mean was 2.928. However, a reliability analysis produced an alpha score of .5685, indicating the scale could be replicated nearly 57 percent of the time (Wearden, 1993). Further, the alpha could not be increased more than slightly by removing one of the variables from the index.

Two other measures – indexes – were created to gauge the level of additional desktop publishing technology used by Pennsylvania weekly newspapers. One index gauged technology used by news-editorial personnel, and the other measured similar technology used by advertising personnel. The indexes measured the use by each newspaper of modems, scanners, graphics software, photo editing software and "other" electronic technology. The levels of use are shown in Table 3. Reliability analyses

Table 3

Index of Combined Use of Modems, Scanners, Graphics Software, Photo Editing Software and Other Electronic Technology

	Number of weekly newspapers	
	News-editorial personnel	Advertising personnel
Use no added types of technology	20	30
Use one type	25	10
Use two types	22	29
Use three types	5	4
Use four types	4	15
Use five types	12	0
Mean	1.818	1.591
alpha	.7466	.6950

conducted on the two indexes found alpha levels that were much stronger than that of the basic technology scale.

In addition to considering respondents as one group, they were weighed as members of subgroups to see if such membership was associated with the level of technology used. Respondents were divided by whether they were from rural or suburban/urban areas. Also considered was the size of a paper in terms of number of pages and circulation. The results showed the level of technology used – as measured by the scale and two indexes – tended to rise as population density and the number of pages published increased. However, a newspaper's circulation was not shown to be a factor.

Chapter 5:

Analysis of the Pennsylvania Weekly Newspaper Technology Study

To analyze the results generated by the Pennsylvania Weekly Newspaper Technology Study, statistical tests were conducted to gauge the effect selected demographic factors did or did not have on a newspaper's use of technology. A discussion of the rationale for selecting the statistical tests used in this study and definitions of some of the terms used may be found in Appendix C.

Analysis

The demographic factors considered were a newspaper's area of publication, number of pages in a typical issue and circulation. The number of pages in a typical issue was positively associated with the scale and two indexes in results that were found to be statistically significant (see Table 4).

Table 4

Level of Association Between Pages in a Typical Issue and the Scale and Indexes of Technology Use

		Pages in a typical issue		
		16 or less	17 to 32	33 or more
Basic technology scale				
Mean		2	3.2	3.29629
Pearson's *r*	.43656			
Significance	.00004			
News-editorial index				
Mean		0.6	1.75	3.0370
Pearson's *r*	.57828			
Significance	.00000			
Advertising index				
Mean		0.64	1.6944	2.3333
Pearson's *r*	.45403			
Significance	.00001			

Note. The higher the Pearson's *r*, the greater the association between the variables. To be considered statistically significant, the significance figure should be .05 or less (Wearden, 1993).

A second factor, the area of publication, was positively associated with the two indexes in results that were found to be statistically significant (see Table 5). A test to measure the association between the basic technology scale and the publication area was not quite statistically significant.

Table 5

Level of Association Between Area of Publication and the Scale and Indexes of Technology Use

		Area of Publication	
		Rural	Suburban/Urban
Basic technology scale			
Mean		2.6923	3.1395
Pearson's *r*	.20689		
Significance	.06219		
News-editorial index			
Mean		1.1707	2.3913
Pearson's *r*	.37387		
Significance	.00036		
Advertising index			
Mean		1.1707	1.9565
Pearson's *r*	.27338		
Significance	.01041		

Note. The higher the Pearson's *r*, the greater the association between the variables. To be considered statistically significant, the significance figure should be .05 or less (Wearden, 1993).

The third factor, a newspaper's circulation, was not found to be associated with the scale or indexes in results that were statistically significant.

Interestingly, relatively strong levels of association were found among the scale and indexes in results that were statistically significant (see Table 4 in Appendix B).

As both the number of pages in a publication and the area of publication yielded levels of association with many of the dependent variables that were statistically significant, those factors were considered more closely. Three-way testing was conducted to check the level of association between the number of pages in a newspaper and the scale and indexes by the area in which a newspaper was published. The testing yielded results that were statistically significant in all but one case – the one seeking to measure the association between the number of pages and the advertising additional technology index for rural newspapers (see Table 6).

Table 6

Association Between Pages in a Typical Issue and the Scale and Indexes of Technology Use by Area of Publication

		Pages in a typical issue		
		16 or less	17 to 32	33 or more
Rural				
Basic technology scale				
Mean		1.8571	3.2608	2
Pearson's *r*	.41424			
Significance	.00875			
News-editorial index				
Mean		0.625	1.5217	1.5
Pearson's *r*	.42004			
Significance	.00625			
Advertising index				
Mean		0.875	1.3913	1
Pearson's *r*	.19139			
Significance	.23065			
Suburban/Urban				
Basic technology scale				
Mean		2.1666	3.0833	3.4
Pearson's *r*	.40483			
Significance	.00709			
News-editorial index				
Mean		0.375	2.1538	3.16
Pearson's *r*	.53903			
Significance	.00011			
Advertising index				
Mean		0	2.2307	2.44
Pearson's *r*	.47826			
Significance	.00077			

Note. The higher the Pearson's *r*, the greater the association between the variables. To be considered statistically significant, the significance figure should be .05 or less (Wearden, 1993).

In the two cases that were statistically significant for rural newspapers, the tests found that the highest use noted by the basic technology scale and the news additional technology index was at the middle level of pages in a publication.

For suburban/urban newspapers, the highest level of use recorded by the scale and two indexes was for newspapers with the greatest number of pages (see Table 6).

Discussion

So, what does the Pennsylvania Weekly Newspaper Technology Study mean?

For one thing, it indicates that as newspapers grow in terms of how many pages they publish they generally increase their use of basic desktop computer-related technology. Also as page numbers increase, so generally does news and advertising personnel use of additional desktop-related technology – modems, scanners, graphics software, photo editing software and other technologies.

The study also indicates a larger use of basic technology among newspapers in metropolitan areas than in rural areas – though not by an overwhelming amount. Also, the use of additional desktop-related technology in metropolitan areas is roughly twice that of use in rural areas.

Further, the results indicate that additional technology is used somewhat more for news functions than for advertising functions.

Also, the study indicates the levels at which a newspaper uses basic and additional technology are related. That level of association is strongest in the area of the use of additional desktop-related technology by news and advertising personnel.

Still, the most interesting results appear to be in the three-way testing in which the association of the scale and indexes to the number of pages in a typical issue of a newspaper is broken down by the area of publication. True, there is a greater use of basic technology by metropolitan area newspapers, but the increase generally is not overwhelming if a range of means of different page amounts is considered (see Table 6).

In the news index, the increase at the high end of such a range is striking, with metropolitan area newspapers using additional technology at about twice the level of rural newspapers. But at the low end of the range, whether newspapers are rural or metropolitan seems to have little effect as papers with 16 or fewer pages use very little additional technology in newsrooms. Similar results occur in the index of added technology used by advertising people.

To what does this all add up?

In general, almost all papers in the sample (86 of 88) have and use the basic engine of electronic technology – the desktop computer. This basic piece of hardware can be used to create a newspaper electronically via pagination software. And as indicated by an extensive literature review, pages can be output using laser printer technology, with which nearly two-thirds of Pennsylvania weekly newspapers are familiar, the study indicates.

Further, the study indicates that use of basic desktop computer-related technology – to write, to edit, to network, to paginate partly or wholly – does not vary greatly between rural and metropolitan areas. Indeed, rural newspapers were three of the four respondents who said they create pages using electronic pagination technology – including for the placement of photographs. Therefore, location does not seem to be a barrier to the acquisition and use of technology.

Yet whether rural or metropolitan, those newspapers publishing the least pages reported using the least technology – either that considered as basic in the study or as additional desktop-related technology. What is being measured by the number of pages? The number of pages published by a newspaper often is determined by the amount of advertising it has. Therefore, this measure quite possibly is linked to a newspaper's relative affluence.

So, again, what is the study finding?

Basically, desktop publishing technology is available to most weekly newspapers and is used least by the smallest operations, which may be the least affluent. That should not seem surprising – that those with the least have the least. Yet desktop publishing technology has been heralded as a cost-saver in the production of newspapers (Balter, 1989, February 28; Guglielmo, 1988, November 1; Waltz, 1993, April 12; Wood, M., 1991, January-February; "A word to the wise," 1987, October 12). Indeed, there is a growing list of functions that can be performed by desktop publishing-related technologies (see Appendix D). And it is far from being a remotely considered issue as a great deal of literature has been written through the years on desktop computer-related topics (see Appendix E).

In the first chapter of this report, a question facing newspapers concerning pagination was posed: Should they use this technology or not?

It is not a question that can be answered collectively. Each publisher and editor has to consider the costs and benefits for individual newspapers in individual markets. But the abilities and quality of desktop publishing and related technologies are expanding and improving. And the costs are going down. This would seem to make this method of publication increasingly attractive – especially to the smallest and least affluent publications, which this study found to be those least likely to use it.

Perhaps the question should be amended: Does a newspaper adopt desktop publishing technology, or does it accept the risk that someone else may do so in its market and offer advertisers a less expensive way to reach readers?

An Overview of the Pennsylvania Weekly Newspaper Technology Study

In nontechnical terms, several factors were tested to see if they were associated with increased or decreased use of desktop publishing technology. In other words, was a newspaper more likely to use more technology as it produced more pages, was sold to more people or was published in an area of greater population density?

The tests found the scale of basic technology use and the indexes of added technology used by news and advertising personnel were linked to the number of pages produced. The use of technology tended to rise as the number of pages increased.

A weaker link was found between the population density of a newspaper's area and the added use of desktop publishing-related technology by news and advertising personnel. Overall, the use rose as a newspaper was produced in a more populated area; however, the increase was less than that related to the number of pages published. The link between the scale of basic technology use and the population level of a newspaper's area was weak, with overall use increasing slightly as population density rose. Further, the test pairing population density and basic technology use did not quite meet the requirements to be classified as statistically significant.

Testing did not find the level of technology used to be linked to a newspaper's circulation level.

As tests involving the number of pages published and the population density of the area of publication were statistically significant, tests were constructed to probe these factors more closely. A test found that the largest metropolitan papers used basic technology at a slightly higher level than did rural papers producing 17-32 pages. (There were only two rural papers producing 33 or more pages and they used less technology, as recorded by the scale and two indexes, than rural papers producing 17-32 pages.) This would seem to indicate that being outside an urban area is not a large barrier to the adoption of basic desktop publishing-related technology.

But other tests, involving the indexes of news and advertising personnel use of additional technology, found large metropolitan area newspapers used technology at about twice the rate of rural newspapers producing 17-32 pages. Still regardless of the area of publication, news and advertising personnel at newspapers publishing 16 or fewer pages used very little additional technology – modems, scanners, graphics software, photo editing software and other technologies.

Overall, this shows the growth of a newspaper's technology use generally is related to the population density of the area in which it is produced and to the number of pages published. Further, the strongest influencing factor appears to be the number of pages published. In addition, the tests' most dramatic finding may be that small papers – those publishing 16 or fewer pages – generally use the least desktop publishing technology. Further, this finding was not related to the population density of the newspaper's area.

Inasmuch as the number of pages published by a newspaper is often related to the amount of advertising it has, the factor may measure a publication's affluence to some degree. Therefore, the study may be finding that those newspapers with the least resources use the least desktop publishing-related technology. This seems ironic as much of the technology has been found to be fairly inexpensive and cost saving – two things that would seem to benefit small operations greatly.

Chapter 6:

Interviews with selected Pennsylvania weekly newspaper journalists

Interviews with seven Pennsylvania weekly newspaper journalists provided a picture of how desktop computers and desktop publishing technologies can be used to produce newspapers.

The journalists were selected to be interviewed because their organizations indicated use of desktop publishing technology in the Pennsylvania Weekly Newspaper Technology Study. The seven journalists were interviewed by telephone in January 1995 by the author of this report. Five of the interviewees agreed to have their comments attributed to them by name, while two agreed to have their comments used anonymously. Interviews ranged from about 40 minutes to an hour.

Economic benefits

Several people reported economic benefits from the use of desktop computer technology, and some gave it credit for the survival of their organizations – at least in their current forms (Wilson, 1995b, January, 1995e, January, 1995f, January, 1995h, January). Jim Dyson of The News Eagle in Hawley said desktop publishing has allowed his newspaper to grow from a single 8-page issue a week 20 years ago to three issues a week totaling more than 50 pages today (Wilson, 1995e, January). Desktop publishing, Dyson said, lets his organization do more in less time at less expense (Wilson, 1995e, January). Desktop publishing let another interviewee's organization cut costs, so it could survive a recession (Wilson, 1995b, January). This interviewee said desktop publishing can let a lot of smaller newspapers survive (Wilson, 1995b, January). Frances Fowler, president of The Johnsonburg Press Inc., said her organization's switch to desktop computers in 1988 has cut the number of employees in half to three and helped the paper economically (Wilson, 1995f, January). Also, a cut in production area personnel needs was noted by Francis Volpe, editor of the Murrysville Area Star and Norwin Star, who agreed that desktop publishing has led to cost savings and revenue enhancement (Wilson, 1995i, January). Further, Warren W. Patton, managing editor of the Times Chronicle in Jenkintown, said desktop publishing is a more efficient system, noting that his company is less labor-intensive than it was five or six years ago (Wilson, 1995g, January). In addition, Patton said desktop publishing has sped up newspaper production and produces newspapers of better technical quality (Wilson, 1995g, January). Ken Piper, managing editor of the Ebensburg News Leader, also noted desktop technology has cut his newspaper's personnel needs as his staff has dropped from five to three with the use of pagination (Wilson, 1995h, January). Indeed, Piper felt that any newspaper that doesn't consider desktop publishing is going to be left behind – if it hasn't been already (Wilson, 1995h, January). Further, he anticipates colleges will focus on it, and quality people will head to desktop publishing newspapers (Wilson, 1995h, January).

With such strong endorsements of desktop publishing technology in the production of newspapers, one is left with a basic question: How do they do it?

Desktop pagination

The computer most commonly used is the Macintosh, in one version or another. Three organizations use them from text input through electronically paginated page output (Wilson, 1995b, January, 1995g, January, 1995h, January). Another newspaper enters text mainly on IBM compatibles, then moves it through an ASCII filter to the Macintosh platform, where electronic pages may be created (Wilson, 1995e, January). However, Dyson considered this process to be cumbersome and has recommended that The News Eagle convert to only Macintosh computers (Wilson, 1995e, January). At another organization, news text is entered on old Mycrotek terminals and MycroLink software is used to move the text to Macintosh computers – though the organization is considering retiring the Mycrotek machines from the news side of the operation and using only Macintosh computers (Wilson, 1995i, January). However, at another organization, text is input and electronic layouts created on IBM compatibles, while ads are created separately on Macintoshes, printed and pasted onto pages (Wilson, 1995a, January). Also, one organization produces its news copy and ads on computers but only rarely paginates pages; it uses three Macintoshes, basically, but has one IBM and plans to replace its aging Macintosh computers with IBMs (Wilson, 1995f, January). In short, a variety of methods have proven usable.

A variety of software also is used to enter text and paginate pages or typeset copy. For entering text, interviewees said their newspapers use Baseview's NewsEdit for the Macintosh, MacWrite,

MacWrite II Options, Microsoft Word for the IBM compatible, Microsoft Word for the Macintosh, PageMaker for the Macintosh, and XyWrite for the IBM compatible. For paginating pages or typesetting copy, interviewees said their newspapers use Atex's Archetype for the IBM compatible, PageMaker for the Macintosh, QuarkXPress for the Macintosh, and QuarkXPress for the Macintosh in a process that can involve Ad Director and Page Director. Ad Director, which has been renamed Page Director Advertising Layout System, is ad dummying and management software, and Page Director software, which has been renamed Page Director Editorial Layout System, offers a publication management and planning system.

Text also is put into newspaper systems in ways other than someone typing on a computer keyboard in-house. Contributors can send in stories on floppy disks (Wilson, 1995a, January, 1995b, January, 1995i, January), copy can be received via modem (Wilson, 1995b, January, 1995e, January, 1995g, January, 1995i, January) and copy can be scanned in (Wilson, 1995b, January, 1995e, January, 1995g, January). Patton of the Times Chronicle noted that the modem and scanner let the newspaper avoid having to re-keyboard copy into the computer system (Wilson, 1995g, January). Receiving copy on a floppy disk can be useful in the same way. Further, press releases can be received on a fax machine (Wilson, 1995e, January), and they may then be scanned into the system.

After text has been entered, it has to be prepared for printing – whether in column form to be pasted onto pages or as part of complete or partial pages. The journalists interviewed reported using desktop publishing software for both typesetting and pagination purposes.

At The News Eagle, about 15 percent to 20 percent of the pages are paginated, and this can include text, rules, graphics, photos and advertisements (Wilson, 1995e, January). Publisher Dyson noted that this mainly involves pages inside issues, like church and classified pages (Wilson, 1995e, January). In its process, The News Eagle brings all page elements through networks and floppy disks to a Power Mac 8100, where all elements may be put together in PageMaker:

- Text is brought into the Power Mac over a TOPS network;
- Photos are scanned into the Power Mac;
- Graphics come from other Macintosh computers or are scanned in and brought into the Power Mac – generally via an Appletalk network and sometimes by floppy disks;

– Advertisements flow over an Appletalk network, mainly, from the Macintosh computers in the advertising department to the Power Mac, and

– Pages are printed in three tiles – 8 1-2- by 14-inches each – for each broadsheet page on an Apple LaserWriter Pro 630, a printer with a resolution of 600 dots per inch (dpi) (Wilson, 1995e, January).

Dyson said his system works fairly well, though he would like to go to a faster network, such as Ethernet, and he would like to have a broadsheet-size laser printer (Wilson, 1995e, January).

Another newspaper uses a simpler process to paginate all its pages, with halftones and advertisements produced separately and pasted onto pages (Wilson, 1995a, January). That organization moves copy from computer to computer by floppy disk, a method the interviewee said did not cause a big problem as their building is relatively small (Wilson, 1995a, January). At the newspaper, individual files are put on floppy disks and taken to someone who puts everything on a hard drive, and the pages are then laid out electronically and printed out on a laser printer (Wilson, 1995a, January).

The editor of the Murrysville Area Star and Norwin Star said his organization electronically paginates all editorial pages, though without photographs and advertisements (Wilson, 1995i, January). Volpe said all elements are placed in one desktop computer and output directly on a broadsheet-size imagesetter, a process that avoids network traffic (Wilson, 1995i, January). The organization bought two 1,200 dpi imagesetters for about $100,000 approximately three years ago, and output is generated at a faster 800 dpi (Wilson, 1995i, January). Volpe said his page files are often 100k or less and rarely over 300k, with the larger files those that include graphics (Wilson, 1995i, January).

The newspapers had been using 2,500 dpi typesetters previously, yet no readers have complained of a difference in type quality (Wilson, 1995i, January). Further, Volpe noted that they have won layout quality awards since the change to imagesetters; just as one or two such awards had been won before the switch (Wilson, 1995i, January). Overall, Volpe said the change has allowed better design because pages are considered all at once as opposed to the traditional method in which elements to be pasted up may be too short or long (Wilson, 1995i, January). Although he acknowledged that editors tend to spend a little more time as production people instead of as people focusing on copy, Volpe said the pluses can outweigh the minuses in terms of overall newspaper quality (Wilson, 1995i, January).

At the Times Chronicle, production is from the desktop:

– Copy is input in MacWrite II Options, with files stored in a To Be Edited folder on a dedicated Macintosh file server, and copy is moved to the OK To Print folder after it is edited;

– Advertising personnel create pages in Ad Director, and that document is converted to a Page Director document, and that document is converted to a QuarkXPress document, and at this point in the process electronic pages have been created;

– Each section of the paper is saved as a separate document with each containing up to 10 to 12 pages, though such large documents can be broken into smaller documents of fewer pages;

– Then the paper divides up the pages by the type of copy content (police, religion, lifestyle, general news, etc.);

– Then boxes are drawn for content (photographs, graphics, copy, etc.);

– Then files are imported into copy or photo boxes, though some photographs are pasted on as PMTs;

– Photographs and graphics are kept on a separate server and the organization archives them by the week of publication and subarchives them by the particular newspaper involved;

– All front-page photographs, which are generally color, are pulled into photo boxes;

– Then they output color pages to a Linotronic printer, which automatically creates CMYK color separations, and

– All noncolor pages are sent to a broadsheet-size PageScan laser printer that also prints at tabloid size, which they do for special sections (Wilson, 1995g, January).

In their process, different types of servers are used to hold different kinds of elements – such as advertisement servers, photo servers and copy servers – with different servers used to avoid crashes and for speed (Wilson, 1995g, January).

Times Chronicle Managing Editor Patton said the editorial side of the operation has become its own production department in the area of pre-press to a large extent, though there are still some production workers who lay in photos and advertisements and create PMTs. Further, pages are sent to a remote printing facility, with about 80 percent sent electronically via modem (Wilson, 1995g, January).

The remaining 20 percent are display pages that may take too much time to send electronically (Wilson, 1995g, January). Patton noted that inside pages generate files of up to 60k to 100k, while the front page generates a file from 800k to 5,000k, with the size depending on how much color is used (Wilson, 1995g, January).

Desktop graphics

The interviewees also reported using other desktop-related technology in the production of their newspapers. Graphics are used with news and advertising content. Images may be received on CD-ROMs (Wilson, 1995e, January), which may be supplied by advertising services (Wilson, 1995h, January). They can be turned into digital form by scanners (Wilson, 1995a, January, 1995b, January, 1995e, January, 1995f, January, 1995g, January, 1995i, January). Graphics also can be created and/or edited with different kinds of software (Wilson, 1995a, January, 1995b, January, 1995e, January, 1995g, January, 1995i, January). Among the software used by interviewees to create graphics were Aldus (now Macromedia) Freehand, Archetype (for 3D pie charts and 2D bar charts) and Adobe Illustrator, and Archetype was used to create color separations of graphics and screens. Also, Adobe Photoshop and Epson Scantastic were named as scanner software used, with Adobe Photoshop and Aldus Freehand used to edit graphics.

Computerized photography

In addition, desktop technology is used in the processing of photographs. Photos may be scanned, with halftones printed on a laser printer and pasted onto pages (Wilson, 1995a, January). The interviewee said the pictures look good, but the darkroom originals have to be lightened about 30 percent before they are scanned (Wilson, 1995a, January). Meanwhile since July 1994, The News Eagle has gone to a digital darkroom, with all photographs handled electronically. For photographs taken in-house, the film is developed and slides and negatives are scanned into the system with a Nikon Coolscan (Wilson, 1995e, January). Sometimes outside sources provide continuous-tone photographs, and these are scanned in with an Epson scanner (Wilson, 1995e, January). All photos are then printed out through a LaserWriter Pro 630 – either as individual pictures to be pasted on pages or as part of electronically paginated pages (Wilson, 1995e, January).

Patton of the Times Chronicle said it takes only about a tenth the time it took about three years ago to scan and store color photos (Wilson, 1995g, January). As an example, he said a 6- by 6-inch photo can be scanned, separated and stored in less than five minutes (Wilson, 1995g, January). Indeed, using Adobe Photoshop the organization can do such things as edit out flaws and change the resolution, brightness and colors (Wilson, 1995g, January). The software also makes it possible to alter the content of a photograph, something Patton's organization considers unethical (Wilson, 1995g, January).

Creating advertisements electronically

A relatively simple process can be used to generate advertisements electronically. At The Johnsonburg Press Inc., advertisements are created in PageMaker, with text input in that software and graphics either scanned and imported in or pasted on after advertisements have been printed on an Apple LaserWriter (Wilson, 1995f, January). The ads are pasted on pages (Wilson, 1995f, January). At The News Eagle, PageMaker is used to produce all advertisements, with graphics scanned and positioned in PageMaker files (Wilson, 1995e, January). Most advertisements are printed individually and pasted on pages, but some are printed as part of complete paginated pages (Wilson, 1995e, January). All output is on a 600-dpi LaserWriter Pro 630 (Wilson, 1995e, January). The Times Chronicle uses QuarkXPress, and Adobe Photoshop at times, in the production of advertisements (Wilson, 1995g, January). Black and white advertisements are then printed on a laser printer and pasted on pages, with space for the advertisement created on a page in Ad Director (Wilson, 1995g, January). Some color advertisements are created in Quark and output along with the news copy on a Linotronic printer (Wilson, 1995g, January). At the Ebensburg News Leader, QuarkXPress is used, with text input on advertisements (Wilson, 1995h, January). Graphics are drawn from CD-ROMs (Wilson, 1995h, January). And Volpe said production people at his organization generally use PageMaker, Aldus Freehand and Adobe Photoshop to create advertisements that are printed out on an imagesetter or laser printer and pasted on pages (Wilson, 1995i, January).

In these cases, advertisements are created using a relatively simple process involving some combination of software, scanners, CD-ROMs and printers. Yet there are other types of desktop-related technology that also can be used in the area of advertising. Volpe said his organization receives a few advertisements by modem and a few by floppy disk (Wilson, 1995i, January). Further, the advertising department archives some ads (Wilson, 1995i, January). Also, Dyson said The News Eagle uses a fax machine to communicate with advertisers: receiving some orders, sending proofs and receiving some advertising copy from regular advertisers (Wilson, 1995e, January). In addition, Piper said desktop publishing lets an advertisement be altered quickly so a customer can make changes and see them fast (Wilson, 1995h, January).

Indeed, the idea of serving the needs of the customer holds true in the area of news as well as advertising. Patton of the Times Chronicle, which makes extensive use of desktop publishing-related technology, said that what matters most is appealing to the reader with good stories, good news, good ethics (Wilson, 1995g, January).

"Content counts" (Wilson, 1995g, January).

Chapter 7:

The future newspaper

In an age moving closer to the continuous flow of digitized information, the future of newspapers seems an open issue for weeklies and dailies alike. Indeed, media consultant David Cole has pointed out that the move is away from using material in just one medium, such as newsprint (Wilson, 1995a, March). One may ask: Why is that?

Traditional newspapers have their drawbacks, including a labor-intensive distribution method and being a major contributor to the growing piles of trash in landfills (Baskette, Sissors, & Brooks, 1992). Up to 60 percent of production costs have been attributed to distribution and printing (Aumente, 1994). Indeed, Seybold Report on Desktop Publishing editor Peter Dyson has said the use of paper is nearing its ceiling and that more electronic document distribution products were needed (Rooney, 1992, October 5). In fact, analysts have said electronic document distribution products have comprised one of desktop publishing's fastest growing parts (Rooney, 1992, October 5). In addition, Adobe CEO John Warnock, a speaker at the Seybold Computer Publishing Seminar in February 1992 in Boston, felt the dominance of print in information sales would soon start losing ground to computer-based electronic media (Egol, 1992, April 1); however, this has not yet happened (C. Schierhorn, personal communication, April 12, 1995). Further, electronic document distribution is offered by state-of-the-art publishing software (Bielawski, 1992, May 19). Indeed, Interleaf Inc. has thought that, in the future, preparing documents will involve electronic preparation and crossing platforms to electronically distribute them, with many of these documents existing in different kinds of databases and not on paper (Radding, 1992, September 15).

Though it is not clear exactly how this would affect the technology needed and used by newspapers, it seems to imply the possibility of an alternative computer "press" for use by newspapers – or new competitors. Dyson has pointed out that some newspapers are looking at the prospect of reusing materials in electronic media, which he noted puts a premium on having the paper generated electronically (Wilson, 1995c, March). Further, Cole said it has become apparent that the reuse, or repurposing, of material is very easy to do with a desktop system (Wilson, 1995a, March). And concerning electronic publishing, consultant David Neeff has noted that weekly newspapers need to ensure that they can address electronic and print publication issues with the same hardware and software (Wilson, 1995d, March).

At least as far back as 1988, publication consultant/designer Roger Black predicted an eventual merger of electronics and the print media, with video text possibly catching on (Jaben, 1988, September). This expectation was voiced even after Knight-Ridder quit its Viewtron videotex service in 1986 after losing about $50 million (Cauley, 1994, February 3). More recently, efforts have been made to develop a new medium – the magic box – that weds print and broadcasting advantages (Baskette, Sissors, & Brooks, 1992). It would let consumers get the type of information desired, when desired, in the form desired (text, audio, video), let consumers shop and bank at home with items delivered, and let consumers print out information if so desired (Baskette, Sissors, & Brooks, 1992). All the technology pieces of the magic box were available by 1992, though the distribution means were not clear (Baskette, Sissors, & Brooks, 1992).

Another effort has been made by a group of volunteers at Stanford University to develop an interactive MediaLink campus news service, which combines text, audio and video on a computer (Driscoll, 1992, September). However, time was a developmental concern. The first three stories took about 600 hours overall to create, according to MediaLink mastermind Scott D. Kirk, who hoped to drop the preparation time to 10 to 15 hours a story (Driscoll, 1992, September). Another developmental concern has been storage space as stories needed to be 5 megabytes or less and a 30-second video clip uses 1.8 megabytes (Driscoll, 1992, September). The 5-megabyte limit has been imposed so most of the Macintosh computers the service has been geared for can receive the stories (Driscoll, 1992, September).

Still another effort has been made at the University of Missouri, where the Digital Missourian, an electronic newspaper, has been tested (Solimeno, Tribute, Karsh, Joner, & Edwards, 1992, August 10; Terrell, 1992, September). Optel, a program by Optical Telecommunications of Denver, was used to create the paper (Terrell, 1992, September). IBM supplied computers in the experiment and Synaptic Micro Solutions also took part (Solimeno et al., 1992, August 10). The goal of the experimenter, University of Missouri instructor Jeff Adams, has been to merge eventually on the computer both television and print (Terrell, 1992, September). The Beaumont (Texas) Enterprise and the Los Angeles weekly Radio & Records also have become users of the Optel software, which has been offered not as a replacement but as an enhancement of the printed product – a way to sell more advertising and provide more information faster (Solimeno et al., 1992, August 10).

Another way to convey an electronic publication is on a CD-ROM. Indeed, CD-ROM disks are called multimedia software's medium of choice (Carlton, 1994, June 1). In addition, booming sales of multimedia PCs, which handle high-quality video and sound, have fueled heightened demand for CD-ROM programs (Carlton, 1994, June 1). Further, Sony estimates that in the United States there are in excess of 6 million CD-ROM players being used – and about 2 million of them may be in homes (Perry, 1994, May 23).

The idea of a CD-ROM publication is not just theoretical. Verbum Magazine: The Journal of Personal Computer-Aesthetics (circulation 40,000) first offered a limited edition CD–ROM version in January 1991 for $49.95 (Horton, 1991, January 1), a price not likely to seem attractive to many newspaper readers. Yet by late 1992, Apple Computer multimedia systems software product marketing manager Doug C. Campeljohn was saying technology could handle production of an electronic, interactive monthly magazine that he thought could be sold for $1 an issue on a CD–ROM (Driscoll, 1992, September). Campeljohn also felt technology was advancing fast enough that there might be no barriers to creating an electronic, interactive daily paper in about a year (Driscoll, 1992, September). As for the applicability of print media skills in the multimedia arena, Verbum Magazine: The Journal of Personal Computer-Aesthetics publisher Michael Gosney has anticipated the movement of more and more print designers to multimedia because many electronic design tools – like those used to create illustrations – also are used in multimedia production (Horton, 1991, January 1).

Another method of electronic information delivery is through an online service. Indeed, experts foresee a future for online services in the electronic news market, and millions of people already subscribe to them (Aumente, 1994). In fact, several of the articles from trade journals and publications cited in this study were obtained through one such service, CompuServe, which says it offers more than 70 basic services ("CompuServe. The awards," 1994, April 20) and has 2 million subscribers (Trachtenberg & Sandberg, 1994, May 27). Other online services include eWorld, Prodigy and America

Online (Mossberg, 1994, June 23). Already many newspapers (Cauley, 1994, February 3) and magazines in part (Cox, 1994, February 18) can be found online. Indeed, TIME Online began in September 1993 and by mid-1994 was averaging 60,000 to 70,000 users a week ("Time to offer," 1994, May 23).

Further, you may recall hearing of the Internet, a global information network said to have 20 million users (Sandberg, 1994, June 1). Also, online rivals are joining with cable systems to offer faster data-transmission links – links that would let personal computer users receive new multimedia services (Sandberg, 1994, May 23). Further, PC-cable links can be built less expensively than multibillion-dollar interactive video projects, and the transmission speed nears that of TV pictures and sound (Sandberg, 1994, May 23). A cable link would let PC users listen to a speech by clicking a button, and a Prodigy marketer has said users will be able to view video clips on their PCs by 1995 (Sandberg, 1994, May 23). Online services have been participating in tests of cable-to-computer connections (Sandberg, 1994, May 23). Continental Cablevision Inc. in Exeter, N.H., also offers a cable link to Internet, which is using more and more sound and graphics (Sandberg, 1994, May 23).

Still another digital publication possibility comes through fax machines. Integrated Software Systems Inc.'s Fax News has let users publish fax publications to individuals, groups of subscribers or to regions, and it has included advertisement handling and automatic transmission features (Solimeno et al., 1992, August 10). With it, faxes can be transmitted at set delivery times or automatically as types of news become available – with the subscriber selecting the times or types of information (Solimeno et al., 1992, August 10). ISSI has said a key to success is keeping subscription costs low, which means funds have to come from such places as advertising (Solimeno et al., 1992, August 10).

Then there are services like Dow Jones CustomClips, which scans Dow Jones newswires, The New York Times News Service, The Wall Street Journal, plus hundreds of publications and offers to supply information via e-mail, fax or online (Dow Jones & Company Inc., 1994, May 26). Another service offered through The Wall Street Journal is 24-hour access via touchtone phone and an 800 or 900 phone number to business headlines, company news and stock quotes that are always being updated (Dow Jones & Company Inc., 1994, May 26). Also, the Evansville (Ind.) Courier has offered an audiotext service providing voice mailboxes for local school teachers ("Attendees gobble up," 1992, July). It has been called the Homework Hotline and has benefited the paper in terms of community image and revenue as the system has let teachers leave homework assignments in voice mailboxes and students and parents have been able to call in and get them ("Attendees gobble up," 1992, July). The hotline has been sponsored by a grocery store that has run a promotional message as the hotline greeting starts ("Attendees gobble up," 1992, July).

Also, technology has been developed that allows signals needed to generate good video pictures to be transmitted through standard copper phone wire, and computer technology has been created to handle a nationwide multimedia service (Hudson, 1994, March 2). Indeed, thanks to digital technology, competition and relaxed regulations, the computer, cable and phone industries are converging (Ziegler, 1994, February 25). Southwestern Bell Corp. and Cox Enterprises Inc. have joined in a venture to buy cable properties (Ziegler, 1994, February 25). Meanwhile, two other Baby Bells, Pacific Telesis Group and Ameritech, are independently spending billions of dollars to make two-way video "pipelines" of their telephone systems (Ziegler, 1994, February 25). And by no means are these the only players in the game.

Options for weeklies

Though this may seem beyond the scope of a weekly newspaper operation, there are electronic media options for relatively smaller operations. Neeff feels weeklies could publish information on the World Wide Web, a virtual network of text and graphics connected to the Internet (Wilson, 1995d, March). Cole and Dyson also see electronic possibilities for newspapers, such as online publication, fax news systems and bulletin board systems (Wilson, 1995a, March; Wilson, 1995c, March). Dyson indicates a benefit of such electronic efforts currently is to gain experience for future ventures (Wilson, 1995c, March). Yet, Cole notes that such systems can make money for weekly newspapers, though that depends on how well they are run (Wilson, 1995b, March).

Indeed, Cole points out that a bulletin board system can be set up on inexpensive, used Macintosh or DOS-based computers running anything from freeware [public domain software] to software costing around $5,000 (Wilson, 1995b, March). Therefore, if the newspaper uses a computer it already has, a system can be started for perhaps as little as the cost of installing phone lines to hook it up (Wilson, 1995b, March). Or a Macintosh-based system could be started using $5,000 software that provides a graphical user interface and lets Macintosh and Windows clients tie into it (Wilson, 1995b, March). A graphical user interface lets a person find items on a computer by using icons instead of by typing in commands.

All the customer needs is a computer and a modem (Wilson, 1995b, March). Bart Zandbergen, operations manager for Spider Island Software, which offers Telefinder BBS software for $675, says his company's software runs on a Macintosh and notes that a modem is needed for dial-up service but not if a computer is linked to a network (Wilson, 1995e, March).

Where one starts when setting up a bulletin board system depends largely on one's plan, and Cole stresses the importance of planning (Wilson, 1995b, March). Indeed, Cole says the technology can be deceptively simple to set up, and with planning and good personnel it can be a relatively straightforward operation to set up a system for disseminating information (Wilson, 1995b, March).

Basically, Cole says a Macintosh or IBM compatible comes with one serial port that can handle one phone line; cards can be purchased to allow for additional ports (Wilson, 1995b, March). He says he would start with one machine, a few phone lines and a plan for future expansion, noting it is important to plan for the peak use of the system (Wilson, 1995b, March). He would then consider expanding to two machines so that if one crashed the other could handle all calls (Wilson, 1995b, March). Indeed, newspapers have to weigh the technical responsibility of running a system like this as opposed to contracting with an online system in return for giving up a significant part of the proceeds (Wilson, 1995b, March).

Cole sees two basic approaches to advertising online – one being traditional space sales and the other getting advertisers to sponsor the system for periods of time, such as a few months (Wilson, 1995b, March). A third method would combine the first two approaches in some way, such as linking online advertisements with space advertisements in the organization's physical newspaper (Wilson, 1995b, March).

In producing a bulletin board system, a newspaper will draw on data used for the paper, but it must do more than just put all its files online, Cole believes, as the main purpose of the online service is to interact with the reader after he or she has read the story (Wilson, 1995b, March). Indeed, issues to consider include how much of its content a newspaper will put online and how much time it will take to do that (Wilson, 1995b, March). Further, time must be devoted to have someone interact with the reader online, and the response should be made quickly, although it initially may indicate that a more thorough answer will be provided later (Wilson, 1995b, March). Readability is also a question to consider (C. Schierhorn, personal communication, April 12, 1995).

Cole points out that in addition to operating a dial-in bulletin board system, an organization may wish to publish on the Internet, doing the same basic things (Wilson, 1995b, March). Further, newspapers may consider publishing information in fax, audiotext and CD-ROM media (Wilson, 1995b, March). Indeed, Cole considers the current electronic media as the first step away from only using ink on paper (Wilson, 1995b, March).

Conclusion

There are many technologies bringing the future rushing to the door. Software that lets you produce a "newspaper" to pass from computer to computer. Technology that lets you create a "newspaper" that talks and/or wiggles. News products pressed and passed about on compact disks. Or online. Or through a fax machine. Or over a telephone line. Or via e-mail. Or through a cable system. Or through an international information network. Or . . .

And it can feed it to the consumer 24 hours a day. Every day.

In an article that notes the rapid expansion of e-mail in general, The Wall Street Journal quotes an academician: " 'E-mail is part of the whole movement to 24-hour accessibility,' says John Staudenmaier, a historian of technology at the University of Detroit. 'It's disgusting, way too much. It leads to an overload that will spawn a backlash' " (Zachary, 1994, June 22, p. A1).

Yet the technological "whiz-ardry" is with us for good and ill.

Roger Fidler, the director of Knight-Ridder's Information Design Laboratory, believes the future will put newspapers in electronic news tablets (Aumente, 1994; Webb, 1995, February 18). Fidler has said the portable tablet will be about the size of a half-inch thick magazine, weigh about two pounds and could begin taking the place of newspapers by the year 2001 (Aumente, 1994). Further, he has said the devices will likely cost less than $400 and be consumer items within a decade (Webb, 1995, February 18). Yet, he has noted that the industry's switch from paper to digital tablet could take 25 years or more (Webb, 1995, February 18). The tablet is expected to let editors create newspapers that include audiovisuals, sidebars and graphs (Aumente, 1994). Several companies are developing electronic tablets (Aumente, 1994).

Rome, N.Y., Daily Sentinel publisher Stephen Waters (1993, July/August) has held that the only remaining obstacle to the appearance of electronic newspapers is the development of a lightweight, wide-screen, wireless viewing screen. But he has forecast problems as well. Probable problems – beginning in the 1995 to 2000 time range – are expected from advertising revenue loss due to advertisers running interactive shopping channels (Waters, 1993, July/August). He has held that survival depends on a restructuring of the operation, with both electronic and print publications offered and the electronic version coming either with or without advertising, with the latter version costing more (Waters, 1993, July/August). Further, he has held that each department will have to stand on its own as a cost and profit center (Waters, 1993, July/August).

However, a countering point of view was given by a respondent to the Pennsylvania Weekly Newspaper Technology Study. At the end of the questionnaire, in response to no question, the person wrote: "Only the typesetter uses electronic gadgets. The four reporters use typewriters. One uses a manual portable machine with a broken return bar. Don't laugh. We consistently win major journalism awards. We are experienced newspaper people who know the community. We work hard and rely on brains, talent and background, not computers, electronics and machines. We might even win a Pulitzer Prize some day. . . ."

So, one may ask, which way is tomorrow?

Perhaps both ways. A newspaper cannot overlook the effect new technology can have to heighten competition for advertising dollars. At the same time, newspaper journalists must focus first on the quality of the information they convey and not on "gadgets." Still, these need not be goals pulling newspapers in opposite directions.

Digital technology can help newspapers offer products that are cost-effective and attractive to readers and advertisers. That would seem to enhance news products' marketability regardless of the medium – or media – newspapers select to convey information. Further, digital technology can be used to collect, analyze, organize and present news and advertising information in a timely manner. That would seem to help journalists fill the goal of serving the needs of the community.

Further, to the extent technology lowers costs, it would seem to lower barriers, making it feasible for more people to create new products that offer different perspectives in the marketplace of ideas. This raising of more voices could provide a more balanced news report that leaves fewer segments of society standing silent at its margins. It also could raise more competitors for newspapers (C. Schierhorn, personal communication, April 12, 1995).

Obviously, the technology an individual enterprise selects depends on that business's financial and market situation. But to the degree newspapers move into a multimedia arena, they may meet their broadcast counterparts more directly in a battle for the audience. For the author to discuss what might happen then would be speculation beyond the scope of this study. It can only be hoped that such a contest would lead to greater professionalism – not more entertainment – from all journalists. It can only be hoped that the victors of such a battle would be the people we claim to serve.

As for the use of technology, it seems the key is to remember that computer technology is simply a tool – albeit one that can do many things very fast and fairly well. Still, it is a tool nonetheless. And within ever-expanding technological limits, it can go only as far as the imagination of the human brain that powers it.

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Author Notes

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Appendix A

Pennsylvania Weekly Newspaper Technology Study questionnaire

This appendix contains the text of the questionnaire used to survey the level of technology used in late 1993 by weekly newspapers in Pennsylvania. The questionnaire has 25 questions.

Questionnaire

(Circle or complete all items that apply at your newspaper.)

1. Newspaper location (town or city): ____________________

2. Newspaper name: ____________________

3. Your name: ____________________

4. Your position: ____________________

5. How often is your paper published? ____________________

6. In what type of area is your paper located?
   a) urban   b) suburban   c) rural

7. What is your paper's circulation?
   a) 2,000 or less   c) 5,001 to 10,000
   b) 2,001 to 5,000   d) 10,001 or above

8. What type of circulation do you have?
   a) paid   b) free   c) both

9. On what do reporters write stories at your paper?
   a) typewriter   c) IBM PC or clone
   b) terminal tied to mainframe computer   d) Apple Macintosh

10. How do editors edit copy at your paper?
    a) using pencil and paper   c) both
    b) on a computer
    (please name ____________________)

11. How do advertising personnel design advertisements? (Fill in any that apply.)
    a) on a computer
    (please name hardware ____________________)
    (please name software ____________________)
    b) other method
    (please name ____________________)

12. How does your paper create pages? (Circle all that apply.)
    a) manually pasting elements on pages   c) paginate fully
    b) paginate all but photographs   d) use page dummies

13. If you paginate, what type of computers do you use to do so?
    (please name ____________________)

14. What forms of pagination technology are used?
    a) proprietary systems (please name ____________________)
    b) desktop publishing (please name ____________________)
    c) none

(PLEASE COMPLETE OTHER SIDE OF QUESTIONNAIRE)

15. How is copy set at your paper?
a) phototypesetter linked to computer
(please name ______________________________)
b) laser printer
(please name ______________________________)
c) other method
(please name ______________________________)

16. How many pages are in a typical issue? ______________

17. What percentage of advertising is designed by computer? ____

18. What percentage of advertisements in your paper are placed electronically using a pagination system? ________

19. What percentage of pages are paginated, with the exception that photographs are not placed electronically? _______

20. What percentage of pages are paginated, including photos? __

21. If computers are networked at your paper:
a) what software is used? ______________________
b) what file server is used? ____________________
c) what network cards are used? ________________

22. What other electronic technology is used by news-editorial personnel at your paper?
a) modems (please name ____________)
b) scanners (please name ____________)
c) graphics software (please name ____________)
d) photo editing software (please name ____________)
e) other (please name ____________)

23. What other electronic technology is used by advertising personnel at your paper?
a) modems (please name ____________)
b) scanners (please name ____________)
c) graphics software (please name ____________)
d) ad design software (please name ____________)
e) photo editing software (please name ____________)
f) other (please name ____________)

24. If other technology forms are used by news-editorial personnel at your paper, how are they used?

25. If other technology forms are used by advertising personnel at your paper, how are they used?

Appendix B

Pennsylvania Weekly Newspaper Technology Study tables and tests

This appendix contains tables created from and statistical tests conducted on data from the Pennsylvania Weekly Newspaper Technology Study. In that study, each of the 173 newspapers named in the 1992 Editor & Publisher yearbook as a Pennsylvania weekly newspaper was mailed a 25-item questionnaire (see Appendix A for complete questionnaire). The questionnaire was first mailed on Aug. 19, 1993. A postcard encouraging recipients to participate in the study was mailed Aug. 27. A second mailing of the questionnaire was made on Sept. 30 and Oct. 1. Responses were received for 88 newspapers, with the last one postmarked Dec. 28, 1993. The data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS).

Table 1

Frequency of newspapers operating at different levels on the basic technology use scale SCALTEST

```
SCALTEST  TEST TECHNOLOGY SCALE

                                                  Valid     Cum
Value Label              Value  Frequency  Percent  Percent  Percent

                           .00         2      2.3      2.4      2.4
                          1.00         4      4.5      4.8      7.2
                          2.00        24     27.3     28.9     36.1
                          3.00        24     27.3     28.9     65.1
                          4.00        26     29.5     31.3     96.4
                          5.00         3      3.4      3.6    100.0
                          9.00         5      5.7  Missing
                                   -------  -------  -------
                         Total        88    100.0    100.0

Mean          2.928     Median       3.000     Std dev       1.080
Minimum        .000     Maximum      5.000

Valid cases      83     Missing cases      5
```

Table 2

Frequency of newspapers' news personnel using different levels of additional desktop computer-related technology as gauged by the index NDINDEX

```
NDINDEX   NEWS DESKTOP INDEX

                                                  Valid     Cum
Value Label              Value  Frequency  Percent  Percent  Percent

                           .00        20     22.7     22.7     22.7
                          1.00        25     28.4     28.4     51.1
                          2.00        22     25.0     25.0     76.1
                          3.00         5      5.7      5.7     81.8
                          4.00         4      4.5      4.5     86.4
                          5.00        12     13.6     13.6    100.0
                                  -------  -------  -------
                         Total        88    100.0    100.0

Mean          1.818     Median       1.000     Std dev       1.630
Minimum        .000     Maximum      5.000

Valid cases      88     Missing cases      0
```

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Table 3

Frequency of newspapers' advertising personnel using different levels of additional desktop computer-related technology as gauged by the index ADINDEX

```
ADINDEX   ADVERTISING DESKTOP INDEX

                                                        Valid     Cum
Value Label              Value  Frequency  Percent   Percent   Percent

                           .00         30     34.1      34.1      34.1
                          1.00         10     11.4      11.4      45.5
                          2.00         29     33.0      33.0      78.4
                          3.00          4      4.5       4.5      83.0
                          4.00         15     17.0      17.0     100.0
                                  -------  -------   -------

                         Total         88    100.0     100.0

Mean          1.591     Median       2.000      Std dev      1.435
Minimum        .000     Maximum      4.000

Valid cases      88     Missing cases      0
```

Table 4

Correlation coefficient matrix of paired variables

```
                    - -  Correlation Coefficients  - -

Variable              Variable              Variable              Variable
Pair                  Pair                  Pair                  Pair
--------              --------              --------              --------

NDINDEX      .8325    NDINDEX      .6414    NDINDEX      .3739    NDINDEX      .1386
with      N(   88)    with      N(   83)    with      N(   87)    with      N(   70)
ADINDEX   Sig .000    SCALTEST  Sig .000    AREAPUB   Sig .000    CIRCULN   Sig .252

NDINDEX      .5783    ADINDEX      .6506    ADINDEX      .2734    ADINDEX      .1462
with      N(   88)    with      N(   83)    with      N(   87)    with      N(   70)
PUBSIZE   Sig .000    SCALTEST  Sig .000    AREAPUB   Sig .010    CIRCULN   Sig .227

ADINDEX      .4540    SCALTEST     .2069    SCALTEST     .0716    SCALTEST     .4366
with      N(   88)    with      N(   82)    with      N(   65)    with      N(   83)
PUBSIZE   Sig .000    AREAPUB   Sig .062    CIRCULN   Sig .571    PUBSIZE   Sig .000

AREAPUB     -.0160    AREAPUB      .4640    CIRCULN      .3788
with      N(   69)    with      N(   87)    with      N(   70)
CIRCULN   Sig .896    PUBSIZE   Sig .000    PUBSIZE   Sig .001

Sig is 2-tailed, "." is printed if a coefficient cannot be computed.
```

Table 5

Cross-tabulation of the basic technology use scale SCALTEST by the area of publication, plus statistical tests

```
SCALTEST  TEST TECHNOLOGY SCALE  by  AREAPUB  TYPE OF PUBLICATION AREA

                   AREAPUB      Page 1 of 1
         Count    |
         Col Pct  |RURAL     SUB URBN
                  |                      Row
                  |      1  |      2  |  Total
SCALTEST  --------+---------+---------+
            .00   |      1  |      1  |      2
                  |    2.6  |    2.3  |    2.4
                  +---------+---------+
           1.00   |      3  |      1  |      4
                  |    7.7  |    2.3  |    4.9
                  +---------+---------+
           2.00   |     15  |      9  |     24
                  |   38.5  |   20.9  |   29.3
                  +---------+---------+
           3.00   |     11  |     12  |     23
                  |   28.2  |   27.9  |   28.0
                  +---------+---------+
           4.00   |      6  |     20  |     26
                  |   15.4  |   46.5  |   31.7
                  +---------+---------+
           5.00   |      3  |         |      3
                  |    7.7  |         |    3.7
                  +---------+---------+
         Column         39        43       82
          Total       47.6      52.4    100.0

      Chi-Square                  Value           DF              Significance
--------------------           -----------       ----             ------------

Pearson                          12.91756          5                  .02416
Likelihood Ratio                 14.52274          5                  .01261
Mantel-Haenszel test for          3.46721          1                  .06260
      linear association

Minimum Expected Frequency -      .951
Cells with Expected Frequency < 5 -      6 OF     12 ( 50.0%)

                                                                   Approximate
     Statistic                      Value       ASE1      T-value  Significance
--------------------              ---------   --------    -------  ------------


Gamma                               .34526     .15252     2.19965


Pearson's R                         .20689     .11099     1.89144     .06219
Spearman Correlation                .23866     .10881     2.19816     .03083
Eta :
   with SCALTEST dependent          .20689
   with AREAPUB  dependent          .39690

Number of Missing Observations:  6
```

Table 6

Cross-tabulation of the news personnel desktop technology index NDINDEX by the area of publication, plus statistical tests

```
NDINDEX  NEWS DESKTOP INDEX  by  AREAPUB  TYPE OF PUBLICATION AREA

                   AREAPUB      Page 1 of 1
             Count |
           Col Pct |RURAL     SUB URBN
                   |                      Row
                   |      1  |      2  |  Total
NDINDEX    --------+---------+---------+
               .00 |     14  |      6  |    20
                   |   34.1  |   13.0  |  23.0
                   +---------+---------+
              1.00 |      8  |     17  |    25
                   |   19.5  |   37.0  |  28.7
                   +---------+---------+
              2.00 |     17  |      4  |    21
                   |   41.5  |    8.7  |  24.1
                   +---------+---------+
              3.00 |      2  |      3  |     5
                   |    4.9  |    6.5  |   5.7
                   +---------+---------+
              4.00 |         |      4  |     4
                   |         |    8.7  |   4.6
                   +---------+---------+
              5.00 |         |     12  |    12
                   |         |   26.1  |  13.8
                   +---------+---------+
            Column       41        46       87
             Total     47.1      52.9    100.0

      Chi-Square                 Value          DF              Significance
--------------------          -----------      ----             ------------

Pearson                        30.50101          5                  .00001
Likelihood Ratio               37.36160          5                  .00000
Mantel-Haenszel test for       12.02065          1                  .00053
      linear association

Minimum Expected Frequency -    1.885
Cells with Expected Frequency < 5 -      4 OF     12 ( 33.3%)


                                                                  Approximate
      Statistic                  Value        ASE1      T-value   Significance
--------------------           ---------    --------    -------   ------------


Gamma                            .38065      .13069     2.81938


Pearson's R                      .37387      .07888     3.71636      .00036
Spearman Correlation             .28545      .10052     2.74600      .00736
Eta :
   with NDINDEX  dependent       .37387
   with AREAPUB  dependent       .59210


Number of Missing Observations:  1
```

Table 7 .

Cross-tabulation of the advertising personnel desktop technology index ADINDEX by the area of publication, plus statistical tests

```
ADINDEX  ADVERTISING DESKTOP INDEX  by  AREAPUB  TYPE OF PUBLICATION AREA

                     AREAPUB      Page 1 of 1
             Count  |
            Col Pct |RURAL    SUB URBN
                    |                   Row
                    |      1 |      2 | Total
ADINDEX     --------+--------+--------+
               .00  |    16  |    14  |    30
                    |  39.0  |  30.4  |  34.5
                    +--------+--------+
              1.00  |     3  |     7  |    10
                    |   7.3  |  15.2  |  11.5
                    +--------+--------+
              2.00  |    21  |     7  |    28
                    |  51.2  |  15.2  |  32.2
                    +--------+--------+
              3.00  |     1  |     3  |     4
                    |   2.4  |   6.5  |   4.6
                    +--------+--------+
              4.00  |        |    15  |    15
                    |        |  32.6  |  17.2
                    +--------+--------+
            Column       41       46       87
             Total     47.1     52.9    100.0

      Chi-Square                 Value           DF          Significance
--------------------          -----------        ----         ------------

Pearson                        24.52699           4             .00006
Likelihood Ratio               30.65796           4             .00000
Mantel-Haenszel test for        6.42732           1             .01124
      linear association

Minimum Expected Frequency -    1.885
Cells with Expected Frequency < 5 -      3 OF    10 ( 30.0%)

                                                                 Approximate
     Statistic                   Value      ASE1      T-value    Significance
--------------------           ---------   --------   -------    ------------


Gamma                           .31455     .14344    2.13454


Pearson's R                     .27338     .09196    2.62025       .01041
Spearman Correlation            .22429     .10444    2.12188       .03676
Eta :
   with ADINDEX  dependent      .27338
   with AREAPUB  dependent      .53096

Number of Missing Observations:  1
```

Table 8

Cross-tabulation of the basic technology use scale SCALTEST by the number of pages in a typical issue of a newspaper, plus statistical tests

```
SCALTEST  TEST TECHNOLOGY SCALE  by  PUBSIZE  PAGES IN TYPICAL ISSUE

                  PUBSIZE                  Page 1 of 1
             Count |
           Col Pct |16 OR LE 17 TO 32 33 OR MO
                   |SS                RE          Row
                   |     1  |     2  |     3  |  Total
SCALTEST   --------+--------+--------+--------+
               .00 |     1  |        |     1  |      2
                   |   4.8  |        |   3.7  |    2.4
                   +--------+--------+--------+
              1.00 |     2  |     1  |     1  |      4
                   |   9.5  |   2.9  |   3.7  |    4.8
                   +--------+--------+--------+
              2.00 |    15  |     8  |     1  |     24
                   |  71.4  |  22.9  |   3.7  |   28.9
                   +--------+--------+--------+
              3.00 |     2  |    12  |    10  |     24
                   |   9.5  |  34.3  |  37.0  |   28.9
                   +--------+--------+--------+
              4.00 |     1  |    11  |    14  |     26
                   |   4.8  |  31.4  |  51.9  |   31.3
                   +--------+--------+--------+
              5.00 |        |     3  |        |      3
                   |        |   8.6  |        |    3.6
                   +--------+--------+--------+
            Column      21       35       27        83
             Total    25.3     42.2     32.5     100.0

      Chi-Square                  Value          DF              Significance
--------------------           -----------      ----             ------------

Pearson                          38.50475        10                 .00003
Likelihood Ratio                 42.82543        10                 .00001
Mantel-Haenszel test for         15.62791         1                 .00008
      linear association

Minimum Expected Frequency -     .506
Cells with Expected Frequency < 5 -     9 OF    18 ( 50.0%)

                                                                Approximate
     Statistic                  Value       ASE1       T-value  Significance
--------------------          ---------   --------    -------   ------------


Gamma                           .56467     .10602     4.97928


Pearson's R                     .43656     .10101     4.36717      .00004
Spearman Correlation            .47803     .09304     4.89814      .00000
Eta :
   with SCALTEST dependent      .50464
   with PUBSIZE  dependent      .60045

Number of Missing Observations:  5
```

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Table 9

Cross-tabulation of the news personnel desktop technology index NDINDEX by the number of pages in a typical issue of a newspaper, plus statistical tests

```
NDINDEX  NEWS DESKTOP INDEX  by  PUBSIZE  PAGES IN TYPICAL ISSUE

                PUBSIZE                 Page 1 of 1
         Count  |
       Col Pct  |16 OR LE 17 TO 32 33 OR MO
                |SS                RE         Row
                |     1  |     2  |     3  | Total
NDINDEX   --------+--------+--------+--------+
            .00 |    16  |     2  |     2  |   20
                |  64.0  |   5.6  |   7.4  |  22.7
                +--------+--------+--------+
           1.00 |     4  |    12  |     9  |   25
                |  16.0  |  33.3  |  33.3  |  28.4
                +--------+--------+--------+
           2.00 |     4  |    18  |        |   22
                |  16.0  |  50.0  |        |  25.0
                +--------+--------+--------+
           3.00 |     1  |     1  |     3  |    5
                |   4.0  |   2.8  |  11.1  |   5.7
                +--------+--------+--------+
           4.00 |        |     3  |     1  |    4
                |        |   8.3  |   3.7  |   4.5
                +--------+--------+--------+
           5.00 |        |        |    12  |   12
                |        |        |  44.4  |  13.6
                +--------+--------+--------+
         Column      25       36       27       88
          Total    28.4     40.9     30.7    100.0

        Chi-Square                  Value             DF              Significance
 --------------------           -----------          ----             ------------

 Pearson                          76.13502            10                 .00000
 Likelihood Ratio                 79.98851            10                 .00000
 Mantel-Haenszel test for         29.09330             1                 .00000
      linear association

 Minimum Expected Frequency -     1.136
 Cells with Expected Frequency < 5 -      9 OF     18 ( 50.0%)

                                                                      Approximate
       Statistic                   Value         ASE1       T-value   Significance
 --------------------            ---------     --------     -------   ------------


 Gamma                             .60635       .09883      5.39530


 Pearson's R                       .57828       .07663      6.57327       .00000
 Spearman Correlation              .54156       .09306      5.97414       .00000
 Eta :
    with NDINDEX  dependent        .57865
    with PUBSIZE  dependent        .68715

 Number of Missing Observations:  0
```

Table 10

Cross-tabulation of the advertising personnel desktop technology index ADINDEX by the number of pages in a typical issue of a newspaper, plus statistical tests

```
ADINDEX  ADVERTISING DESKTOP INDEX  by  PUBSIZE  PAGES IN TYPICAL ISSUE

                  PUBSIZE                Page 1 of 1
          Count  |
         Col Pct |16 OR LE 17 TO 32 33 OR MO
                 |SS                RE         Row
                 |     1  |     2  |     3  | Total
ADINDEX  --------+--------+--------+--------+
            .00  |    17  |     8  |     5  |    30
                 |  68.0  |  22.2  |  18.5  |  34.1
                 +--------+--------+--------+
           1.00  |     1  |     4  |     5  |    10
                 |   4.0  |  11.1  |  18.5  |  11.4
                 +--------+--------+--------+
           2.00  |     6  |    18  |     5  |    29
                 |  24.0  |  50.0  |  18.5  |  33.0
                 +--------+--------+--------+
           3.00  |     1  |     3  |        |     4
                 |   4.0  |   8.3  |        |   4.5
                 +--------+--------+--------+
           4.00  |        |     3  |    12  |    15
                 |        |   8.3  |  44.4  |  17.0
                 +--------+--------+--------+
          Column      25       36       27       88
           Total    28.4     40.9     30.7    100.0

      Chi-Square                 Value             DF            Significance
--------------------          -----------         ----           ------------

Pearson                         39.87672            8               .00000
Likelihood Ratio                40.66979            8               .00000
Mantel-Haenszel test for        17.93454            1               .00002
      linear association

Minimum Expected Frequency -    1.136
Cells with Expected Frequency < 5 -     8 OF    15 ( 53.3%)

                                                                 Approximate
     Statistic                  Value       ASE1      T-value   Significance
--------------------          ---------   --------    -------   ------------


Gamma                           .51759     .11049     4.30081


Pearson's R                     .45403     .08931     4.72568       .00001
Spearman Correlation            .43169     .09655     4.43814       .00003
Eta :
   with ADINDEX  dependent      .45963
   with PUBSIZE  dependent      .55907


Number of Missing Observations:  0
```

Table 11

Cross-tabulation of the basic technology use scale SCALTEST by the circulation of a publication, plus statistical tests

```
SCALTEST  TEST TECHNOLOGY SCALE  by  CIRCULN  CIRCULATION SIZE

                     CIRCULN       Page 1 of 1
              Count |
            Col Pct |5000 OR   5001 OR
                    |LESS      MORE        Row
                    |     1  |      2  |  Total
SCALTEST    --------+--------+---------+
                .00 |        |      2  |     2
                    |        |    6.3  |   3.1
                    +--------+---------+
               1.00 |     2  |      2  |     4
                    |   6.1  |    6.3  |   6.2
                    +--------+---------+
               2.00 |    17  |      7  |    24
                    |  51.5  |   21.9  |  36.9
                    +--------+---------+
               3.00 |     7  |     13  |    20
                    |  21.2  |   40.6  |  30.8
                    +--------+---------+
               4.00 |     7  |      8  |    15
                    |  21.2  |   25.0  |  23.1
                    +--------+---------+
             Column     33        32        65
              Total   50.8      49.2     100.0

       Chi-Square                  Value           DF          Significance
--------------------          -----------         ----         ------------

Pearson                          8.01985            4              .09085
Likelihood Ratio                 8.94842            4              .06240
Mantel-Haenszel test for          .32777            1              .56698
      linear association

Minimum Expected Frequency -     .985
Cells with Expected Frequency < 5 -     4 OF    10 ( 40.0%)

                                                                  Approximate
      Statistic                  Value         ASE1     T-value  Significance
--------------------           ---------     --------   -------  ------------


Gamma                            .19338       .18424    1.04085


Pearson's R                      .07156       .12674     .56948      .57105
Spearman Correlation             .13080       .12601    1.04722      .29900
Eta :
   with SCALTEST dependent       .07156
   with CIRCULN  dependent       .35126


Number of Missing Observations:  23
```

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Table 12

Cross-tabulation of the news personnel desktop technology index NDINDEX by the circulation of a publication, plus statistical tests

```
NDINDEX  NEWS DESKTOP INDEX  by  CIRCULN  CIRCULATION SIZE

                    CIRCULN      Page 1 of 1
            Count  |
          Col Pct  |5000 OR  5001 OR
                   |LESS     MORE       Row
                   |     1  |     2  | Total
NDINDEX    --------+--------+--------+
              .00  |    13  |     7  |    20
                   |  36.1  |  20.6  |  28.6
                   +--------+--------+
             1.00  |    11  |    10  |    21
                   |  30.6  |  29.4  |  30.0
                   +--------+--------+
             2.00  |     8  |    11  |    19
                   |  22.2  |  32.4  |  27.1
                   +--------+--------+
             3.00  |     1  |     4  |     5
                   |   2.8  |  11.8  |   7.1
                   +--------+--------+
             4.00  |     2  |     2  |     4
                   |   5.6  |   5.9  |   5.7
                   +--------+--------+
             5.00  |     1  |        |     1
                   |   2.8  |        |   1.4
                   +--------+--------+
           Column       36       34      70
            Total     51.4     48.6   100.0

      Chi-Square                     Value             DF             Significance
--------------------              -----------         ----            ------------

Pearson                             5.06830             5                .40760
Likelihood Ratio                    5.60792             5                .34626
Mantel-Haenszel test for            1.32627             1                .24947
      linear association

Minimum Expected Frequency -      .486
Cells with Expected Frequency < 5 -      6 OF    12 ( 50.0%)


                                                                        Approximate
      Statistic                    Value        ASE1      T-value     Significance
--------------------             ---------    --------    -------     -----------


Gamma                              .26861       .16874     1.56215


Pearson's R                        .13864       .12084     1.15441        .25237
Spearman Correlation               .18270       .11698     1.53236        .13007
Eta :
   with NDINDEX  dependent         .13864
   with CIRCULN  dependent         .26908


Number of Missing Observations:  18
```

Table 13

Cross-tabulation of the advertising personnel desktop technology index ADINDEX by the circulation of a publication, plus statistical tests

```
ADINDEX  ADVERTISING DESKTOP INDEX  by  CIRCULN  CIRCULATION SIZE

                   CIRCULN      Page 1 of 1
          Count   |
          Col Pct |5000 OR  5001 OR
                  |LESS     MORE      Row
                  |     1  |     2  | Total
ADINDEX   --------+--------+--------+
             .00  |    19  |    11  |   30
                  |  52.8  |  32.4  |  42.9
                  +--------+--------+
            1.00  |     5  |     5  |   10
                  |  13.9  |  14.7  |  14.3
                  +--------+--------+
            2.00  |     8  |    14  |   22
                  |  22.2  |  41.2  |  31.4
                  +--------+--------+
            3.00  |     1  |     3  |    4
                  |   2.8  |   8.8  |   5.7
                  +--------+--------+
            4.00  |     3  |     1  |    4
                  |   8.3  |   2.9  |   5.7
                  +--------+--------+
          Column      36       34       70
           Total    51.4     48.6    100.0

      Chi-Square                    Value            DF             Significance
--------------------             -----------        ----            ------------

Pearson                            5.71722            4                 .22129
Likelihood Ratio                   5.85248            4                 .21044
Mantel-Haenszel test for           1.47428            1                 .22467
      linear association

Minimum Expected Frequency -     1.943
Cells with Expected Frequency < 5 -      5 OF    10 ( 50.0%)

                                                                     Approximate
        Statistic                   Value        ASE1       T-value  Significance
--------------------              ---------    --------    -------   ------------


Gamma                               .28440      .17547     1.57871


Pearson's R                         .14617      .12057     1.21846      .22726
Spearman Correlation                .18624      .11827     1.56313      .12267
Eta :
   with ADINDEX  dependent          .14617
   with CIRCULN  dependent          .28579

Number of Missing Observations:  18
```

Table 14

Cross-tabulation of the basic technology use scale SCALTEST by the number of pages in a typical issue of a newspaper by the area of publication, plus statistical tests

```
SCALTEST  TEST TECHNOLOGY SCALE  by  PUBSIZE  PAGES IN TYPICAL ISSUE
Controlling for..
AREAPUB  TYPE OF PUBLICATION AREA  Value = 1  RURAL

                PUBSIZE                 Page 1 of 1
         Count  |
       Col Pct  |16 OR LE 17 TO 32 33 OR MO
                |SS                RE        Row
                |     1  |     2  |     3  | Total
SCALTEST --------+--------+--------+--------+
           .00  |     1  |        |        |     1
                |   7.1  |        |        |   2.6
                +--------+--------+--------+
          1.00  |     2  |        |     1  |     3
                |  14.3  |        |  50.0  |   7.7
                +--------+--------+--------+
          2.00  |    10  |     5  |        |    15
                |  71.4  |  21.7  |        |  38.5
                +--------+--------+--------+
          3.00  |        |    10  |     1  |    11
                |        |  43.5  |  50.0  |  28.2
                +--------+--------+--------+
          4.00  |     1  |     5  |        |     6
                |   7.1  |  21.7  |        |  15.4
                +--------+--------+--------+
          5.00  |        |     3  |        |     3
                |        |  13.0  |        |   7.7
                +--------+--------+--------+
        Column       14       23        2       39
         Total     35.9     59.0      5.1    100.0

      Chi-Square                  Value         DF             Significance
--------------------           -----------     ----            ------------

Pearson                         25.20172        10                .00498
Likelihood Ratio                29.83564        10                .00091
Mantel-Haenszel test for         6.52072         1                .01066
      linear association

Minimum Expected Frequency -     .051
Cells with Expected Frequency < 5 -    15 OF    18 ( 83.3%)

                                                                Approximate
     Statistic                    Value        ASE1     T-value  Significance
--------------------            ---------    --------   -------  ------------


Gamma                             .64742      .20214    3.36919


Pearson's R                       .41424      .15627    2.76845     .00875
Spearman Correlation              .50344      .15774    3.54421     .00109
Eta :
   with SCALTEST dependent        .60079
   with PUBSIZE  dependent        .60904
```

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Table 14 (continued)

Cross-tabulation of the basic technology use scale SCALTEST by the number of pages in a typical issue of a newspaper by the area of publication, plus statistical tests

```
SCALTEST  TEST TECHNOLOGY SCALE  by  PUBSIZE  PAGES IN TYPICAL ISSUE
Controlling for..
AREAPUB  TYPE OF PUBLICATION AREA  Value = 2  SUB URBN

                  PUBSIZE                Page 1 of 1
          Count  |
        Col Pct  |16 OR LE 17 TO 32 33 OR MO
                 |SS                RE          Row
                 |     1  |     2  |     3  |  Total
SCALTEST --------+--------+--------+--------+
            .00  |        |        |     1  |     1
                 |        |        |   4.0  |   2.3
                 +--------+--------+--------+
           1.00  |        |     1  |        |     1
                 |        |   8.3  |        |   2.3
                 +--------+--------+--------+
           2.00  |     5  |     3  |     1  |     9
                 |  83.3  |  25.0  |   4.0  |  20.9
                 +--------+--------+--------+
           3.00  |     1  |     2  |     9  |    12
                 |  16.7  |  16.7  |  36.0  |  27.9
                 +--------+--------+--------+
           4.00  |        |     6  |    14  |    20
                 |        |  50.0  |  56.0  |  46.5
                 +--------+--------+--------+
         Column         6      12       25       43
          Total      14.0    27.9     58.1    100.0

          Chi-Square                 Value            DF              Significance
--------------------          -----------          ----              ------------

Pearson                          22.69285             8                 .00378
Likelihood Ratio                 22.76686             8                 .00368
Mantel-Haenszel test for          6.88333             1                 .00870
      linear association

Minimum Expected Frequency -      .140
Cells with Expected Frequency < 5 -     11 OF    15 ( 73.3%)

                                                                    Approximate
       Statistic                Value        ASE1       T-value    Significance
--------------------          ---------    --------     -------    ------------


Gamma                           .53368      .15724     2.83539


Pearson's R                     .40483      .14380     2.83488         .00709
Spearman Correlation            .41814      .13637     2.94746         .00527
Eta :
   with SCALTEST dependent      .42436
   with PUBSIZE  dependent      .64882


Number of Missing Observations:  6
```

Table 15

Cross-tabulation of the news personnel desktop technology index NDINDEX by the number of pages in a typical issue of a newspaper by the area of publication, plus statistical tests

```
NDINDEX  NEWS DESKTOP INDEX  by  PUBSIZE  PAGES IN TYPICAL ISSUE
Controlling for..
AREAPUB  TYPE OF PUBLICATION AREA  Value = 1  RURAL

                 PUBSIZE                 Page 1 of 1
          Count  |
        Col Pct  |16 OR LE 17 TO 32 33 OR MO
                 |SS                RE        Row
                 |     1  |     2  |     3  | Total
NDINDEX  --------+--------+--------+--------+
            .00  |    11  |     2  |     1  |    14
                 |  68.8  |   8.7  |  50.0  |  34.1
                 +--------+--------+--------+
           1.00  |     1  |     7  |        |     8
                 |   6.3  |  30.4  |        |  19.5
                 +--------+--------+--------+
           2.00  |     3  |    14  |        |    17
                 |  18.8  |  60.9  |        |  41.5
                 +--------+--------+--------+
           3.00  |     1  |        |     1  |     2
                 |   6.3  |        |  50.0  |   4.9
                 +--------+--------+--------+
         Column       16       23        2       41
          Total     39.0     56.1      4.9    100.0

      Chi-Square                   Value          DF           Significance
--------------------            -----------      ----          ------------

Pearson                          27.80001          6              .00010
Likelihood Ratio                 25.77254          6              .00025
Mantel-Haenszel test for          7.05749          1              .00789
      linear association

Minimum Expected Frequency -      .098
Cells with Expected Frequency < 5 -     8 OF    12 ( 66.7%)

                                                                Approximate
     Statistic                    Value        ASE1     T-value  Significance
--------------------            ---------    --------   -------  ------------


Gamma                             .56787       .20142   2.56732


Pearson's R                       .42004       .17883   2.89054     .00625
Spearman Correlation              .43590       .16598   3.02465     .00439
Eta :
   with NDINDEX  dependent        .45469
   with PUBSIZE  dependent        .47771
```

Table 15 (continued)

Cross-tabulation of the news personnel desktop technology index NDINDEX by the number of pages in a typical issue of a newspaper by the area of publication, plus statistical tests

```
NDINDEX  NEWS DESKTOP INDEX  by  PUBSIZE  PAGES IN TYPICAL ISSUE
Controlling for..
AREAPUB  TYPE OF PUBLICATION AREA  Value = 2  SUB URBN

                PUBSIZE              Page 1 of 1
         Count  |
        Col Pct |16 OR LE 17 TO 32 33 OR MO
                |SS               RE          Row
                |     1  |     2  |     3  | Total
NDINDEX  --------+--------+--------+--------+
            .00 |     5  |        |     1  |     6
                |  62.5  |        |   4.0  |  13.0
                +--------+--------+--------+
           1.00 |     3  |     5  |     9  |    17
                |  37.5  |  38.5  |  36.0  |  37.0
                +--------+--------+--------+
           2.00 |        |     4  |        |     4
                |        |  30.8  |        |   8.7
                +--------+--------+--------+
           3.00 |        |     1  |     2  |     3
                |        |   7.7  |   8.0  |   6.5
                +--------+--------+--------+
           4.00 |        |     3  |     1  |     4
                |        |  23.1  |   4.0  |   8.7
                +--------+--------+--------+
           5.00 |        |        |    12  |    12
                |        |        |  48.0  |  26.1
                +--------+--------+--------+
         Column       8       13       25       46
          Total    17.4     28.3     54.3    100.0

      Chi-Square                  Value          DF            Significance
--------------------          -----------       ----           ------------

Pearson                         43.56800          10               .00000
Likelihood Ratio                43.51381          10               .00000
Mantel-Haenszel test for        13.07481           1               .00030
      linear association

Minimum Expected Frequency -      .522
Cells with Expected Frequency < 5 -    16 OF    18 ( 88.9%)

                                                                   Approximate
     Statistic                   Value       ASE1       T-value    Significance
--------------------           ---------   --------    -------    ------------


Gamma                            .64662      .12665     4.06939


Pearson's R                      .53903      .09759     4.24500       .00011
Spearman Correlation             .53133      .11824     4.16024       .00015
Eta :
   with NDINDEX  dependent       .54626
   with PUBSIZE  dependent       .67255


Number of Missing Observations:  1
```

Table 16

Cross-tabulation of the advertising personnel desktop technology index ADINDEX by the number of pages in a typical issue of a newspaper by the area of publication, plus statistical tests

```
ADINDEX  ADVERTISING DESKTOP INDEX  by  PUBSIZE  PAGES IN TYPICAL ISSUE
Controlling for..
AREAPUB  TYPE OF PUBLICATION AREA  Value = 1  RURAL

                PUBSIZE                     Page 1 of 1
          Count |
        Col Pct |16 OR LE 17 TO 32 33 OR MO
                |SS                RE        Row
                |     1  |     2  |     3  | Total
ADINDEX         --------+--------+--------+
            .00 |     9  |     6  |     1  |    16
                |  56.3  |  26.1  |  50.0  |  39.0
                +--------+--------+--------+
           1.00 |     1  |     2  |        |     3
                |   6.3  |   8.7  |        |   7.3
                +--------+--------+--------+
           2.00 |     5  |    15  |     1  |    21
                |  31.3  |  65.2  |  50.0  |  51.2
                +--------+--------+--------+
           3.00 |     1  |        |        |     1
                |   6.3  |        |        |   2.4
                +--------+--------+--------+
         Column     16       23        2        41
          Total    39.0     56.1      4.9     100.0

      Chi-Square                    Value            DF             Significance
--------------------            -----------         ----            ------------

Pearson                           6.18442             6                  .40285
Likelihood Ratio                  6.75992             6                  .34362
Mantel-Haenszel test for          1.46516             1                  .22611
      linear association

Minimum Expected Frequency -     .049
Cells with Expected Frequency < 5 -      8 OF    12 ( 66.7%)

                                                                      Approximate
      Statistic                    Value          ASE1      T-value   Significance
--------------------             ---------      --------    -------   ------------


Gamma                              .32857         .25188    1.26848


Pearson's R                        .19139         .16552    1.21772     .23065
Spearman Correlation               .20883         .16480    1.33352     .19010
Eta :
   with ADINDEX  dependent         .25442
   with PUBSIZE  dependent         .31537
```

Table 16 (continued)

Cross-tabulation of the advertising personnel desktop technology index ADINDEX by the number of pages in a typical issue of a newspaper by the area of publication, plus statistical tests

```
ADINDEX  ADVERTISING DESKTOP INDEX  by  PUBSIZE  PAGES IN TYPICAL ISSUE
Controlling for..
AREAPUB  TYPE OF PUBLICATION AREA  Value = 2  SUB URBN

                  PUBSIZE                 Page 1 of 1
          Count  |
        Col Pct  |16 OR LE 17 TO 32 33 OR MO
                 |SS                RE          Row
                 |     1  |     2  |     3  |  Total
ADINDEX  --------+--------+--------+--------+
            .00  |     8  |     2  |     4  |    14
                 | 100.0  |  15.4  |  16.0  |  30.4
                 +--------+--------+--------+
           1.00  |        |     2  |     5  |     7
                 |        |  15.4  |  20.0  |  15.2
                 +--------+--------+--------+
           2.00  |        |     3  |     4  |     7
                 |        |  23.1  |  16.0  |  15.2
                 +--------+--------+--------+
           3.00  |        |     3  |        |     3
                 |        |  23.1  |        |   6.5
                 +--------+--------+--------+
           4.00  |        |     3  |    12  |    15
                 |        |  23.1  |  48.0  |  32.6
                 +--------+--------+--------+
         Column        8       13       25      46
          Total     17.4     28.3     54.3   100.0

      Chi-Square                 Value          DF            Significance
--------------------          -----------      ----           ------------

Pearson                         31.15060         8                .00013
Likelihood Ratio                31.62331         8                .00011
Mantel-Haenszel test for        10.29280         1                .00134
      linear association

Minimum Expected Frequency -      .522
Cells with Expected Frequency < 5 -    13 OF    15 ( 86.7%)

                                                                 Approximate
      Statistic                  Value       ASE1      T-value   Significance
--------------------           ---------   --------    -------   ------------


Gamma                            .56117     .14496     3.28977


Pearson's R                      .47826     .11189     3.61230      .00077
Spearman Correlation             .46172     .13091     3.45278      .00124
Eta :
   with ADINDEX  dependent       .54534
   with PUBSIZE  dependent       .62142

Number of Missing Observations:  1
```

Appendix C

Rationale for selection of statistical test used in Pennsylvania Weekly Newspaper Technology Study

This appendix contains a discussion of why Pearson's *r* was chosen for use in the Pennsylvania Weekly Newspaper Technology Study.

Rationale for selection of statistical test used in Pennsylvania Weekly Newspaper Technology Study

As this work is written for two different audiences - one academicians and the other professional journalists - some discussion seems in order in connection with why a certain statistical test was used in Chapter 5 of the Pennsylvania Weekly Newspaper Technology Study. Even though the technical language may not be wholly familiar to professional journalists, this discussion can be comprehended if a few basic terms are understood.

First, the variables are discussed as being either of the ordinal, interval or ratio level. These are categories of variables that relate to the attributes of the variables. The type of statistical test used depends on what kind or kinds of variables are involved. Next, variables will be discussed as being either dependent or independent. In the tests used in Chapter 5, this means that different independent variables - area of publication, pages in publication, circulation of publication - are checked to see if they are associated with the dependent variables. The scale and two indexes measuring technology use - described in Chapter 3 - are the dependent variables. Thirdly, the statistical tests of gamma and Pearson's product-moment correlation (*r*) will be discussed. These tests measure whether variables are associated with each other. Further, the level of statistical significance will be discussed. A commonly used level of significance is .05 (Blalock, 1972), and a finding should be at the level of .05 or less to be considered statistically significant (Wearden, 1993). A .05 reading means the level of association as big as that found in the test could not have been caused more than 5 times out of 100 by a sampling error (Babbie, 1992).

Now, armed with a basic understanding of terms, it is time to proceed to the discussion of what statistical test to use in the Pennsylvania Weekly Newspaper Technology Study.

The scale and both indexes rank-order the use of technology by newspapers, and variables that logically rank-order attributes are considered ordinal (Babbie, 1992). Further, ordinal variables can be categorical or continuous (Wearden, 1993). The scale and indexes in this study are continuous as they rank the amount of different kinds of technology used from 0 to 5. On this study's scale and indexes, a rank of 2 is considered a more extensive use than a rank of 1.

The demographic variables could be considered to be at the ratio level. The area of publication - with a possible response of rural or suburban or urban - is based on the population density of the area, a density based on a zero point as required of a ratio variable (Babbie, 1992). The number of pages in a publication and the circulation of a publication also are based on a zero point. However, all three demographic variables seem to lack the requirement that interval and ratio variables' attributes can be separated by uniform distances (Babbie, 1992). True, a population of 1 is less than another of 2, and the distance between 1 and 2 is the same as that between 1,001 and 1,002, but respondents were only able to put rural, suburban or urban - and that data was collapsed in the study to rural and suburban/urban because of the small number of urban respondents (2). Also, the number of pages published and the circulation levels were placed in relatively few groupings - with the last grouping of each being open-ended - and not in small, uniform increments.

However, area of publication could be considered as a continuous, ordinal variable because a response of suburban or urban implies a greater population density than a response of rural. Also, a response of 17-32 pages published notes a size larger than another of 16 pages or less; and a response of a circulation level of 5,001 or more reports a readership greater than one of 5,000 or less. Therefore, both number of pages in a publication and the level of circulation also could be considered continuous, ordinal variables.

When testing ordinal variables, gamma can measure the level of association (Champion, 1970). However, Babbie (1992) notes support for using Pearson's *r* for ordinal-level variables. Further, Pearson's *r* is used when two continuous variables of the ordinal, interval or ratio level are involved (Wearden, 1993). Also, *r* is used to measure the level of association between quantitative independent and dependent variables (Marascuilo & Serlin, 1988), which seems to be the case in the study reported here. In light of this, Pearson's product-moment correlation and the related levels of significance are reported in this study to gauge the levels of association between the dependent and independent variables.

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Appendix D

Uses of technology

This appendix cites uses of desktop computer technology listed in literature located in a broad search. In the appendix, uses are categorized and listed then followed by the source that provided the use. A specific product is named if one was listed by the source. A full citation of each source is provided in the selected bibliography in Appendix E.

Audiotext

General use

Newspaper offers audiotext service called Homework Hotline that includes voice mailboxes, advertising.
("Attendees gobble up," 1992, July)

CD-ROM

Advertising use

Drives used for images, clip art.
("Electronic ad delivery," 1992, June)

Newspapers can use CD-ROM unit, flatbed scanners to create logo, illustration library.
(Software Consulting Services, undated, "Integrated ad makeup")

Newspapers get advertisements on CD-ROM disks.
("Electronic ad delivery," 1992, June)

General use

CD-ROM disks can hold audio commentary.
(Perry, 1994, May 23)

CD-ROM disks can hold handwritten letters.
(Perry, 1994, May 23)

CD-ROM disks can hold home movies.
(Perry, 1994, May 23)

CD-ROM disks can hold photos.
(Perry, 1994, May 23)

CD-ROM disks can hold text.
(Perry, 1994, May 23)

Kodak Photo CD technology lets users store 35mm film images on compact disks.
(Sullivan, 1992, September 7)

Store digital pictures; view, edit them on computer (Kodak's Photo CD technology).
(Bounds, 1994, February 24)

Database

Advertising use

Demographic, psychographic data producers sell information in electronic form.
(Ward & Hansen, 1993)

Magazine advertising can be customized using databases to target specific customers or customer groups using selective binding techniques.
(Ward & Hansen, 1993)

General use

Create database from collected information.
(Ward & Hansen, 1993)

Databases contain information in set fields. Relational databases produce a central index, which permits more efficient access to data. Relational databases can be used on different computer platforms, if some rules on identifying data fields are used.
(Marshall, 1992, April)

P.INK Press is a publishing management system based on a SQL relational database that runs on Unix or Macintosh stations via Ethernet. The database lets a user access data for page design, photo handling, text editing and administration. The central database holds all graphics, layout, story and copy flow information.
(Corcoran, 1994, July 4)

Store data across many servers (database by Camex).
("Du Pont/Camex," 1991, July 8)

Store music, graphics, text, pictures.
(Ward & Hansen, 1993)

Story storage can replace physical clip files.
(Ward & Hansen, 1993)

Track user-created files (QuarkDispatch in Quark Publishing System).
(Said, 1993, January 11)

Desktop computer

Advertising use

Clients can produce advertisements on PC or Macintosh systems, send pages to printers.
(Klayman & Myers, 1992, October

12)
Create advertisements.
(Elman, 1989, February 6)
Macintosh-based system unveiled that automates newspaper ad process from ad-taking to complete-page output.
(Colbert, 1993, July/August)
Macintosh computers used for ad makeup.
(Solimeno, 1992, May 22)
Macintosh computers used to create advertisements.
(Solimeno, 1991, December 6)

Business use

Macintosh used in billing , accounting systems.
(Cole, 1991, June 25)

General use

Collect wire copy.
(Colbert, 1993, July/August)
Data gathering and analysis.
(Bowles, Borden, & Rivers, 1993)
PC-based front-end editorial system can link wire services.
(Colbert, 1993, July/August)
PC-based system handles color work.
(Horton, 1990, August 1)
PCs used for text entry, editing.
(Solimeno, 1992, May 22)
PCs used for text editing.
("Deadline Data," 1993, January 25)
PCs used for text input.
("Euromax," 1993, January 14)

Archiving
Desktop computer hard drive used to store QuarkXPress page files.
(Hunter, 1990, March)
Electronic libraries.
(Bowles, Borden, & Rivers, 1993)
Graphics
Macintosh produces infographics (Aldus Freehand, Adobe Illustrator).
("Pagination in Portugal," 1993, January 25)
Macintosh used to create informational graphics.
(Cole, 1991, June 25)
Macintosh used to create charts, maps, graphs.
(Silverstone, 1988, November 1)
Macintosh provides wraparound text and easy access to knockout type, color type, manipulated type, lots of tints and background patterns to place behind type.
("Designing the `Macazine'," 1990, June)

Networking
Macintosh computers can link with Harris Images graphics system via LocalTalk connections.
("Harris unveils," 1991, July 8)

Page production
Clients can produce publication pages on PC or Macintosh systems, and send the pages to printers.
(Klayman & Myers, 1992, October 12)
Design, alter pages fast.
(Baskette, Sissors, & Brooks, 1992)
Desktop computer documents can go straight to a press.
(Diaz, 1992a, July 17)
Macintosh computer transmits tabloid-size pages to imagesetters.
("Newspaper creates," 1989, June 6)
Macintosh computer used to generate color pages.
(Solimeno, 1991, December 6)
Macintosh computers use off-the-shelf software to create fully paginated pages.
(Solimeno, 1991, December 6)
Macintosh computers used for page layout.
("Deadline Data," 1993, January 25)
Macintosh computers used for page makeup.
(Solimeno, 1992, May 22)
("Euromax," 1993, January 14)
Macintosh, off-the-shelf software do

all pre-press work for newspaper.
(Balter, 1989, February 28)
Macintosh, QuarkXPress used for pre-press functions.
(Hunter, 1990, March)
Macintosh, QuarkXPress used to paginate all but art, advertising.
(DiNucci, 1993, April 12)
Macintosh used in pre-press systems, page-makeup systems, editorial front-end systems.
(Cole, 1991, June 25)
Macintosh used to paginate opinion newspaper pages, weekly magazine.
(Solimeno, 1991, December 6)
Microcomputer-based systems handle whole high-end publishing process at some foreign daily and American weekly newspapers.
(Silverstone, 1988, November 1)
PC-based system, software can write, design and produce pages.
(Colbert, 1993, July/August)
PCs used for layout.
(Solimeno, 1992, May 22)

Photo editing
Macintosh uses photo-editing software (Adobe Photoshop).
("Pagination in Portugal," 1993, January 25)
Macintosh computers used to process pictures.
(Solimeno, 1992, May 22)
Macintosh with General Purpose Interface Bus uses Newsline Mac software to let user see, size, enhance, crop and use densitometer on photos on network file server.
(Said, 1991, March 5)
PC-based color system links to AP Leaf picture desk.
(Goodnow, 1993, July/August)

Scanning process
Macintosh, drum scanner can be linked.
(Colbert, 1993, July/August)
("Pre-Press links," 1991, July 8)
Macintosh receives images from scanners.
("Pagination in Portugal," 1993, January 25)

Desktop Publishing Software

Advertising use

Display ad elements -- photos, text, order and billing information -- tracked in built-in database of Digital Technology International's AdSpeed.
(Marshall, 1992, April)
File advertisers' images, layouts (CatalogMakerSB).
(Waltz, 1993a, April 12)
Retain caller information so advertisers can contact callers later (product by Brite Voice Systems).
(Rogg, 1993, July)
Turn print ads into voice ads (Ad Interpreter by Brite Voice Systems).
(Rogg, 1993, July)

Classified
Classified advertising software with features from ad-taking to administration -- an accounts-receivable feature is extra (ClassManager -- Baseview QuarkXTension)
(Said, 1990, June 26)
Create classified ads (NewsCAD). Software has optical character recognition feature.
(Waltz, 1993a, April 12)
Create electronic classified ads (product by Brite Voice Systems).
(Rogg, 1993, July)
Shrink-wrapped classified ad software can produce galley output or send files to QuarkXPress.
("Datawindow," 1991, July 8)

Production
Compose advertisements on Macintosh (QuarkXPress).
(Guglielmo, 1988, November 1)
Dummy display advertisements (Ad

Director).
(Alexander et al., 1992, October 30)
Integrate copywriting, artwork, production electronically (Digital Technology International's AdSpeed on networked Macintoshes).
(Marshall, 1992, April)
Link dummies, page layout software (Ad Director).
(Alexander et al., 1992, October 30)
Lock, unlock single advertisements, pages (Ad Director).
(Alexander et al., 1992, October 30)
Manipulate files with pagination product (Dewar Information Service Corp.'s Classified Pagination).
("Dewar Information," 1991, October 23)
Produce magazine-size advertising pages on Macintosh, except for photos (PageMaker).
(Thomas & Rogers, 1988, May)

General use

Communications software lets remote computers send text files Macintosh computers can accept without operator intervention (CommLink -- Baseview QuarkXTension)
(Said, 1990, June 26)
Control typefaces, layout, graphics and text rotation (QuarkXPress for Windows 3.1).
(Sullivan, 1992a, November 16)
Typesetter spooler (QSpool -- Baseview QuarkXTension)
(Said, 1990, June 26)
Video creation.
(Gabbay, 1992, April 10)

Graphics

Clip art programs.
(French, 1992, Fall)
Create graphics.
(Gabbay, 1992, April 10)
Drawing, painting.
(French, 1992, Fall)
Insert graphics into pages.
(Gabbay, 1992, April 10)
Produce infographics (Aldus Freehand, Adobe Photoshop).
("Pagination in Portugal," 1993, January 25)

Networking

Cross-platform software available.
(Bielawski, 1992, May 19)
Electronic document distribution offered by state-of-the-art publishing software.
(Bielawski, 1992, May 19)
Handle AP Leaf Picture Desk images and cutlines on desktop publishing network.
("Technology notes," 1992, August)
Locate photos by searching headers or viewing small versions (NewsPhotoAccess).
(Marshall, 1992, April)
Retrieve information from database as instructed by user; act as on-line service filter (Journalist by PED Software).
(Mossberg, 1994, May 26)
Systems-management software links applications (DewarView).
(Truitt, 1993b, June)
Text, graphic files can be imported from other software.
(Bielawski, 1992, May 19)
XTension links QuarkXPress on Macintosh to IBM PC-based Mycro-Comp front-end newspaper system (Mycro-Comp Page).
(Said, 1991, May 14)

Page production

Create pages (Digital Technology International systems).
(Lehman, 1993, April 12)
Design pages.
(Gabbay, 1992, April 10)
Lock design, text elements so they can't be altered by unauthorized people (Publication Locking -- an XTension by North Atlantic Publishing

Systems).
("North Atlantic," 1991, May 29)
Off-the-shelf software, Macintosh do all pre-press work for newspaper.
(Balter, 1989, February 28)
Page layout.
(French, 1992, Fall)
Page layout (QuarkXPress).
("Newspaper creates," 1989, June 6)
Page layout on Macintosh (Aldus PageMaker).
(Guglielmo, 1988, November 1)
Pagination system.
("Atex to unveil," 1992, May 22)
Produce magazine-size pages on Macintosh, except for photos (PageMaker).
(Thomas & Rogers, 1988, May)
Produce pages except for images (Atex's Capriccio and EdPage; QuarkXPress).
("Pagination in Portugal," 1993, January 25)
QuarkXPress, Macintosh used for pre-press functions.
(Hunter, 1990, March)
QuarkXPress, Macintosh used to paginate all but art, advertising.
(DiNucci, 1993, April 12)
Tiling of tabloid-size pages.
(Petkus, 1987, July)
XTension helps jump story (Mycro-Comp Page).
(Said, 1991, May 14)

Photo, image compression
Compress images (Digital Darkroom; StuffIt).
(Silverstone, 1988, October 11)
Compression software reduces storage space needed for images.
(Schram, 1992, March)
Decompress photo file and change it to positive image.
(Silverstone, 1988, October 11)

Photo, image editing
Adobe Photoshop is used by Macintosh to fine-tune balance, contrast and brightness.
(Said, 1991, March 5)
Crop images (Barneyscan software).
(Silverstone, 1988, October 11)
Edit photos and make color separations.
(Hundertmark, 1992, July)
Fine-tune photos (Adobe Photoshop).
(Silverstone, 1989, November 21)
Fine-tune photos (Digital Darkroom).
("Newspaper creates," 1989, June 6)
Fine-tune photos (QuarkXPress).
(Silverstone, 1988, October 11)
Images can be sharpened, changed (Adobe Photoshop, unnamed other software).
(Leeke, 1993b, April 12)
Make color separations.
("Atex to unveil," 1992, May 22)
Make color separations (QuarkXPress; also PageMaker with added program).
(Jensen, 1992, October 10)
Resize images (Adobe Photoshop).
(Gram-Reefer, 1993, July/August)
Software and a suction-cup device, called Radius Precision Color Calibrator, gauge colors on monitor -- letting newspaper bypass creating color key.
(Said, 1991, March 5)

Scanning
Photos scanned, placed in page layout software.
(Lewis, 1990, October 16)
Photo scanning.
(French, 1992, Fall)

Text
Change TrueType fonts' darkness, slant, contrast, width (Incubator by Type Solutions).
(Scheier, 1992, March 2)
Editing, word processing (QuarkCopyDesk in Quark Publishing System).
(Said, 1993, January 11)
Multi-user copy management and editing program (NewsEdit -- Baseview

QuarkXTension)
(Said, 1990, June 26)
Set type.
(Gabbay, 1992, April 10)
Text editing on Macintosh (Microsoft Word).
(Guglielmo, 1988, November 1)
Typography control.
(Berzof, 1992, February 17)
Typography controls (QuarkXPress).
(Jensen, 1992, October 10)
Word processing.
(French, 1992, Fall)

Wire services

Collect, sort wire stories into folders (Wire Manager -- Baseview)
(Silverstone, 1989, November 21)
Wire-capture program (WireManager -- Baseview QuarkXTension)
(Said, 1990, June 26)

Digital camera

General use

Capture images as computer data (NewsCamera 2000 by Kodak and AP).
("Kodak, AP unveil camera," 1994, February 9)
Digital still camera operates on PCMCIA card (Fujix).
(Kuntz, 1993, July/August)
Kodak offers a digital camera that captures up to five images in a 2.25-second burst. It combines an electronic camera back with a Nikon N90 film camera.
(Corcoran, 1994, June 20)

E-mail

General use

Supply information from news services, publications (Dow Jones CustomClips).
(Dow Jones & Company Inc., 1994, May 26)

Fax

Advertising use

Distribute press releases.
(Watsky, 1992, March 10)
Insert advertisements based on region of edition (Fax News by Integrated Software Systems).
(Solimeno, Tribute, Karsh, Joner, & Edwards, 1992, August 10)
Insert advertisements by matching demographics of individual subscribers with those sought by advertiser (Fax News by Integrated Software Systems).
(Solimeno, Tribute, Karsh, Joner, & Edwards, 1992, August 10)
Send proofs by fax.
(Waltz, 1993a, April 12)

General use

Publish fax publications (Fax News by Integrated Software Systems).
(Solimeno, Tribute, Karsh, Joner, & Edwards, 1992, August 10)
Send pages in pagination system (Crossfield Datrax fax system).
(Atkin, 1990, March)
Supply information from news services, publications (Dow Jones CustomClips).
(Dow Jones & Company Inc., 1994, May 26)
Transmit full-size newspaper pages.
(Colbert, 1993, July/August)

Laptop computer

General use

Used in system for scanning, editing, transmitting photos from field.
(Colbert, 1993, July/August)

Modem

Advertising use

Ads sent via modem to printer.
(Klayman & Myers, 1992, October 12)
Modems, display ad makeup department PCs linked for ad transmissions.
("Electronic ad delivery," 1992, June)
Newspapers receive electronic ads by

modem.
("Electronic ad delivery," 1992, June)

Paper uses electronic bulletin board to let advertisers send in ads by modem.
(Solimeno, 1991, December 6)

Send ad plans to paper by modem.
(Waltz, 1993a, April 12)

Service bureau receives, returns customer files.
(Watsky, 1992, March 10)

Transmit advertisements through a bulletin board service newspapers access via modem.
(Gram-Reefer, 1993, July/August)

General use

Connection by newspapers with on-line services via modem (text uses listed).
(Waltz, 1993b, April 12)

Convert wire photos from analog to digital format (PhotoLink modem by Anaya)
(Silverstone, 1989, November 21)

Digital photo files can be transmitted from remote sites to newsroom Leaf Desks.
(Leeke, 1993b, April 12).

Link MS-DOS laptops to Macintosh computer.
(Guglielmo & Pfiffner, 1989, October 24)

Magazine-size pages can be sent to service bureau via modem.
(Creamer, 1988, June)
(Hunter, 1990, March)

Pages sent via modem to printer.
(Klayman & Myers, 1992, October 12)

Receive files.
(Diaz, 1992a, July 17)

Receive wire copy at 9,600 baud.
(Silverstone, 1989, November 21)

Transfer digitized text through a bulletin board service accessed via modem.
(Gram-Reefer, 1993, July/August)

Transfer graphics through a bulletin board service accessed via modem.
(Gram-Reefer, 1993, July/August)

Transfer photos through a bulletin board service accessed via modem.
(Gram-Reefer, 1993, July/August)

Transmit Macintosh photo file through regular phone lines with 9600-baud modem.
(Silverstone, 1988, October 11)

Transmit files to service bureau.
(Jensen, 1992, February)

Transmit, receive copy from magazine editors working at home.
(Horton, 1990, January)

Networking

Advertising use

Companies can offer goods, services on-line via CommerceNet.
(Sandberg, 1994, June 1)

General use

Bundle of file server software promotes interoperability for networks of users on different platforms.
(Howard, 1994, May 30)

Digital photo network (AP Leaf Picture Desk).
(Leeke, 1993b, April 12)

Interview electronically via e-mail or bulletin board systems.
(Ward & Hansen, 1993)

Link Windows PCs, Sun workstations on Unix via server running Banyan's VINES network operating system.
(Ricciuti, 1992, December 1)

Networked Macintosh computers share scanners, output devices.
(Solimeno, 1991, December 6)

Networking software lets PCs, Macintosh computers exchange files (Netware listed).
(Marshall, 1992, April)

Networks let journalists in remote places, via PCs or portable computers, keep in touch with media organizations.
(Ward & Hansen, 1993)

PC, Macintosh editorial/pagination system linked by a Novell network.

("Deadline Data," 1993, January 25)

Switch articles from the IBM to the Macintosh using Travelling Software's Lap-Link.

(Horton, 1990, January)

System Integrators Inc.'s Mac/55 system connects Macintosh computers, PCs, Tandem Co. mainframes.

(Marshall, 1992, April)

On-line services

America On-Line offers newspapers.

(Cauley, 1994, February 3)

Magazines available -- in part -- via on-line computer services.

(Cox, 1994, February 18)

Magazine available through computer service (TIME Online).

("Time to offer," 1994, May 23)

Provide bulletin boards (eWorld).

(Mossberg, 1994, June 23)

Provide news (eWorld).

(Mossberg, 1994, June 23)

Provide stock quotes (eWorld).

(Mossberg, 1994, June 23)

Provide reference material (eWorld).

(Mossberg, 1994, June 23)

Provide shareware programs that can be downloaded (eWorld).

(Mossberg, 1994, June 23)

Provide e-mail linked to Internet (eWorld).

(Mossberg, 1994, June 23)

Supply information from news services, publications (Dow Jones CustomClips).

(Dow Jones & Company Inc., 1994, May 26)

Output devices

Auxiliary devices

Combine fonts usually found on several cartridges on one FontMaster cartridge for Hewlett-Packard LaserJet printers.

(Scheier, 1992, March 2)

General use

Networking

Laser printer can be linked to network (Apple LaserWriter Pro 630).

(Apple Computer Inc., 1992a)

Laser printers can save 64 configurations; configure paper size, orientation, dpi resolution level, printer language (with Virtual Printer Technology by Dataproducts Corp.).

(Lehman, 1994, May 16)

Laser printer prints for mixed computer environments and networks (LaserJet 4M Plus).

(Hewlett-Packard Co., 1994, June 21)

Laser printer works simultaneously with Macintosh and MS-DOS and Windows-based computers (Apple LaserWriter Pro 630).

(Apple Computer Inc., 1992a)

Part of pagination system.

(Atkin, 1990, March)

Production

Imagesetter generates negatives (AGFA SelectSet 5000).

(Seneca Printing & Label Inc., undated)

Imagesetter produces magazine-size pages, except for photos.

(Thomas & Rogers, 1988, May)

Imagesetters can produce output to film or paper at 1,200 to 2,400 dpi.

(Jensen, 1992, February 24)

Laser printer can produce 11- by 17-inch output at up to 400 dpi and 15 ppm.

(LaPolla, 1992, October 26)

Laser printer prints on letter- and legal-size paper at 600 dpi (Apple LaserWriter Pro 630).

(Apple Computer Inc., 1992a)

Laser printer prints 12 ppm at 600 dpi (HP LaserJet 4 Plus).

(Hewlett-Packard Co., 1994, June 21)

Laser printer with high resolution can generate negatives.

(Klayman & Myers, 1992, October 12)

Laser printers can print 15 ppm or 20 ppm at 800 dpi (by Dataproducts

Corp.).
(Lehman, 1994, May 16)
Laser printers can produce tabloid-size pages at 4 ppm (LaserMaster Corp.).
(Morgenstern, 1994b, July 11)
Laser printers of 1,200 dpi typeset quality are available, though slow.
(Jensen, 1992, February 24)
Magazine-size pages output to film by PC-based desktop technology.
(Horton, 1990, August 1)
Print broadsheet pages on paper or polyester plates.
("Euromax," 1993, January 14)
QMS 1660 Print System can produce nine tabloid-size pages a minute, QMS Inc. says. A version with 24 megabytes of RAM can print tabloid-size pages at 1,200 by 600 dpi, the company says.
(Rothenberg & Morgenstern, 1994, July 4)

Proofing

Company uses 8 1/2- by 11-inch and 11- by 17-inch 400-dpi printers as proofing devices.
(Seneca Printing & Label Inc., undated)
Laser printer used for proofing magazine.
(Thomas & Rogers, 1988, May)
Laser printers used for full-page proofing.
(Solimeno, 1992, May 22)

Scanner, Images

General use

Capture video images (Data Translation QuickCapture board).
("Newspaper creates," 1989, June 6)
Color drum scanner captures image in one pass at up to 2,300 dpi (Linotype-Hell ColorPilot S3300).
(Staten, 1994, April 4)
Color negatives can be used, with scanner, to generate black and white images.
(Leeke, 1993b, April 12)
Convert images from 35mm color negatives into files up to 3 megabytes in size (Barneyscan color slide scanner).
(Silverstone, 1989, November 21)
Drum scanner scans originals at up to 5,200 dpi; enlarges images up to 1,733 percent (DT-S1030AI by Screen).
(Staten, 1994, April 4)
Newspapers can use flatbed scanners, CD-ROM unit to create logo, illustration library.
(Software Consulting Services, undated, "Integrated ad makeup")
Photos scanned in, edited in pre-press pagination system.
(Balter, 1989, February 28)
Put light on image, pick it up and translate it to digital image computer can read.
(Andriatch, 1992, August 24)
Scan faxes into computer with OCR software.
(Duffy, 1992, April 13)
Scan graphics, pictures.
(Andriatch, 1992, August 24)
Scan images, convert it to digital form that software can work with on a personal computer.
(White & Downs, 1993, February)
Scan printed photos (Truvel scanner).
("Newspaper creates," 1989, June 6)
Scan text, convert it to digital form that software can work with on a personal computer.
(White & Downs, 1993, February)
Scan words.
(Andriatch, 1992, August 24)
Scanner part of pagination system.
(Atkin, 1990, March)
Wire service images enter computer system via Leafdesk, go to Atex Image Services servers.
("Pagination in Portugal," 1993, January 25)

Server

General use

Computers made to manage networks;

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handle 25 to 500 PCs (servers by Dell Computer Corp.).
("Dell unveils servers," 1994, February 8)

Wire services collected in server baskets.
(Balter, 1989, February 28)

Storage devices

General use

Color images held on 1-gigabyte [MacinStor] drive.
(Leeke, 1993b, April 12)

Digital information stored on cartridge magnetic disks.
(Cummings, 1994, July 4)

Digital information stored on DAT drives (tape).
(Cummings, 1994, July 4)

Digital information stored on hard drive.
(Cummings, 1994, July 4)

Digital information stored on hard drive arrays.
(Cummings, 1994, July 4)

Digital information stored on optical disks.
(Cummings, 1994, July 4)

Digital information stored on optical disk jukeboxes.
(Cummings, 1994, July 4)

Digital photo files placed on optical drive.
(Leeke, 1993b, April 12)

Files held on floppy disks.
(Hunter, 1990, March)

Files held on hard drive.
(Hunter, 1990, March)

Images placed on file server.
(Leeke, 1993b, April 12)

Kodak Photo CD technology lets users store 35mm film images on compact disks.
(Sullivan, 1992, September 7)

Appendix E

Selected Bibliography

This appendix contains references to 335 works that were considered in the course of this study. The literature relates to computer technology. Notes were taken from the works and cross-indexed in computer files. Many of the works are cited in the body of this project -- Desktop technology for newspapers: Use of the computer tool. Information from others is noted in Appendix D: Uses of technology. Still other works are not cited elsewhere in this project but provide additional general information.

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